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Light and Lighting

April 1961

Entrance to the new office in Sydney of our Netherlands client, in which the predominant feature is the screen to the mezzanine floor formed of plugtes in various metals; it is one of many overseas installations described in this issue as part of our international review.

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Quality at the Dog Show, Prize Poodle (Photo Thomas Fall)

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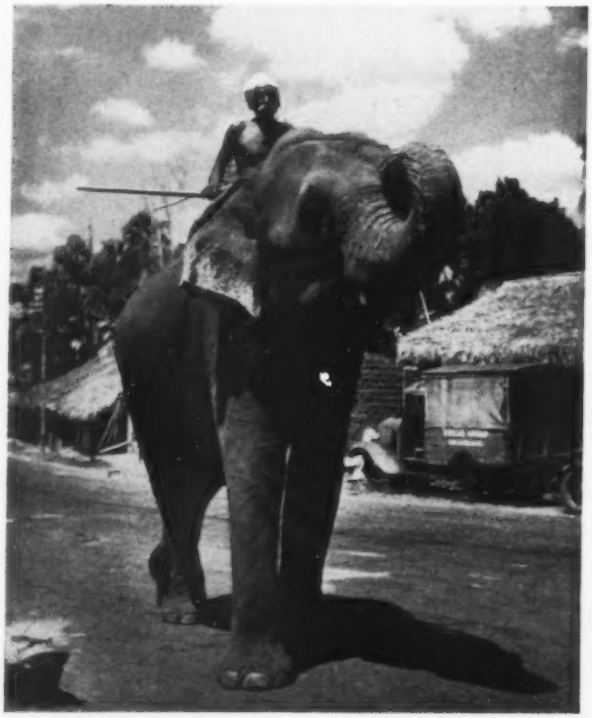

Service by Elephant, Ceylon (Photo J. Allan Cash)

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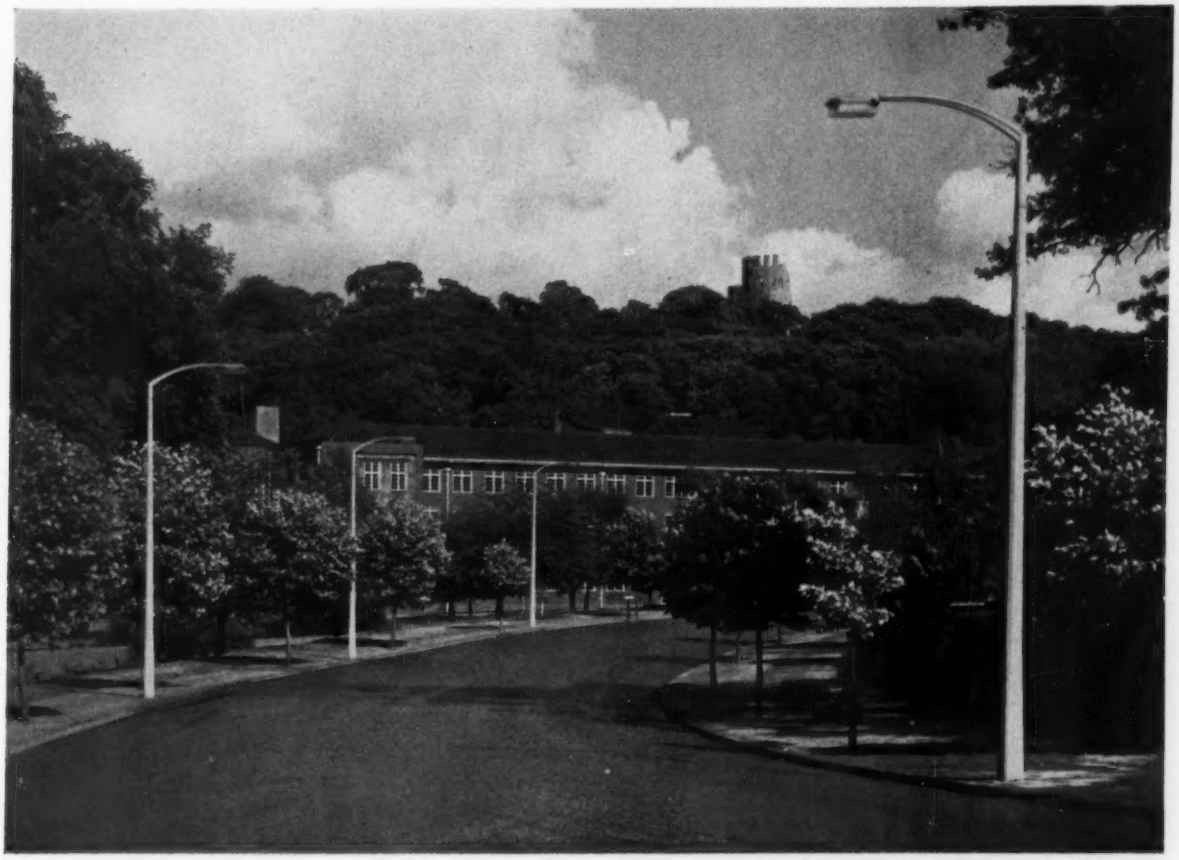


Photograph of one of many Stanton designs acceptable to the Ministry of Transport for use on trunk roads and approved by The Council of Industrial Design.

STANTON

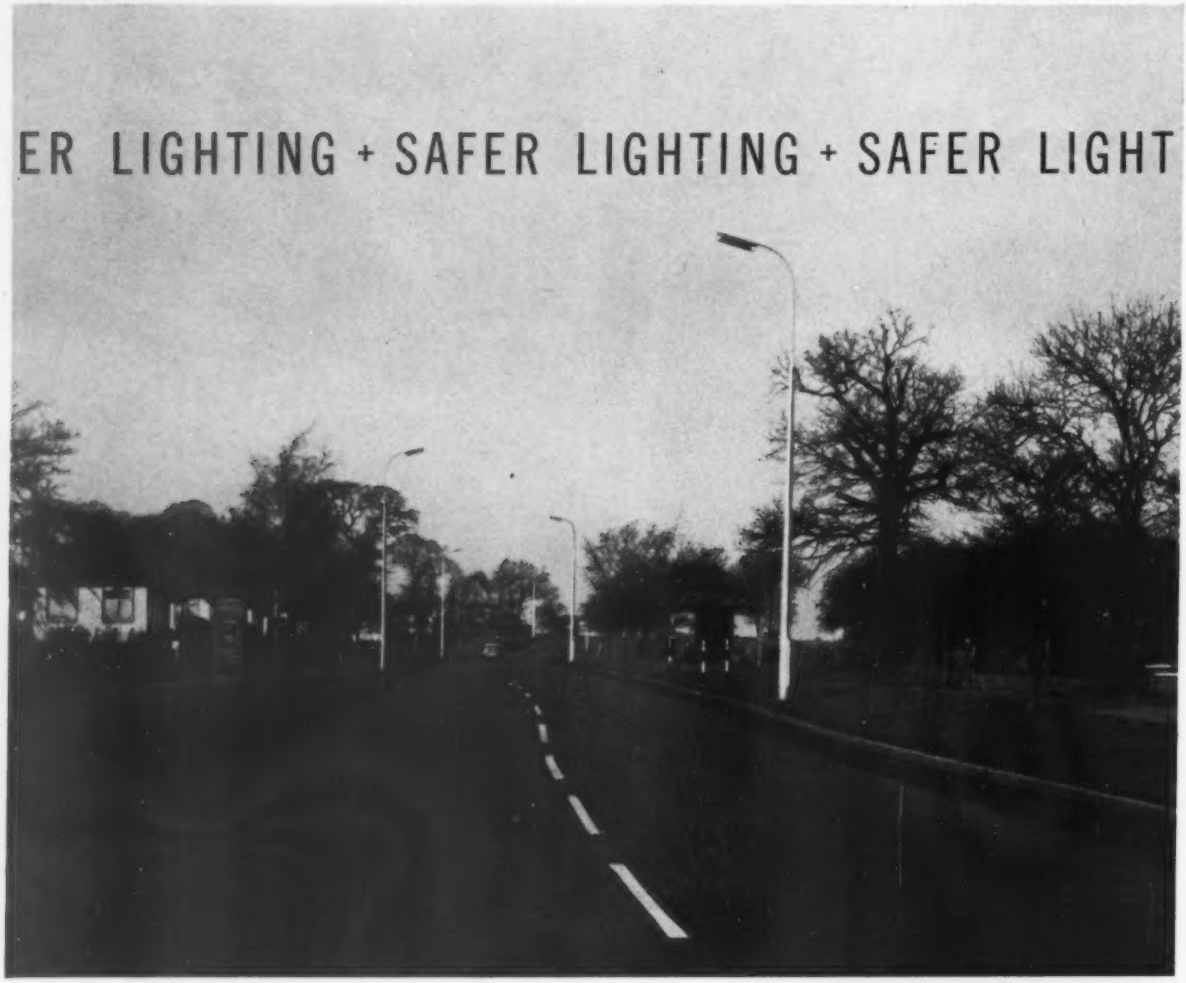
Prestressed Spun Concrete Lighting Columns

Stanton Type 8F Spun Concrete Lighting Columns at Dudley, fitted with Revo C.15342 lanterns.

Photograph by courtesy of D. S. Warren, A.M.I.C.E., A.M.I.Mun.E., Engineer and Surveyor, Dudley.

Spun concrete column under a load of 1,092 lb. showing a deflection of 13¼ inches. (The British Standard 1308:1957 proof test load is 320 lb.)

The Stanton Ironworks Company Limited Near Nottingham



Lighting installation in Fryent Way, Wembley. Photographs reproduced by kind permission of C. W. Steedman Esq., A.M.I.C.E., M.I. Mun.E., M.T.P.I., F.R.S.H., Engineer and Surveyor of the Borough of Wembley.

Wherever you see these elegant Elecoslim columns you can be sure of street lighting that's *completely* efficient. They are made to exacting B.S.I. specifications, and, in the photograph shown here, are equipped with Eleco Golden Ray '200' lanterns, model HW.1041. Each of these lanterns houses one of the new Philips high-efficiency integral sodium lamps in the 200w. rating. The result is bright, clear lighting that ensures excellent visibility, and considerably reduces the risk of accidents. Eleco & Philips frequently work together to produce first-class street lighting schemes. And they will be happy to give you the benefit of their long and successful experience at any time.

ELECO

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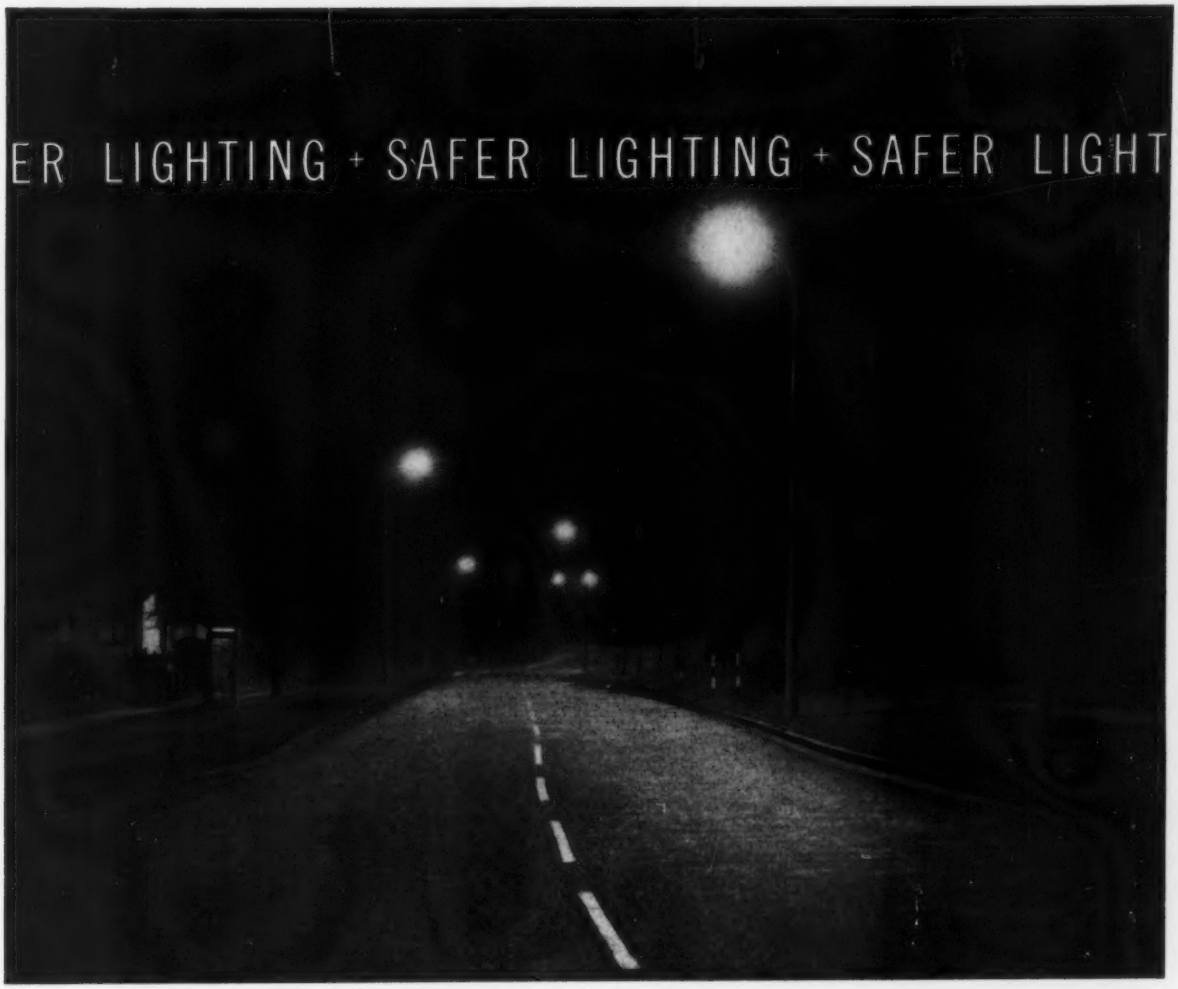

The exceptionally good lighting produced by the Philips range of high-efficiency sodium lamps ensures excellent visibility and considerably reduces the risk of accidents. The 200w. rating, shown here, has an average through-life output of 20,000 lumens. Other lamps in this Philips range show output increases over standard sodium lamps of from 25% in the 140w. rating to 40% in the 45w. rating. The installation pictured here, which was carried out in conjunction with Eleco, using their world-famous lanterns and Elecoslim columns, is a good example of the many first-class street lighting schemes completed by these two companies. Their experience is available to you at anytime.

Lighting installation in Fryent Way, Wembley. Photographs reproduced by kind permission of C. W. Steedman Esq., A.M.I.C.E., M.I. Mun.E., M.T.P.I., F.R.S.H., Engineer and Surveyor of the Borough of Wembley.

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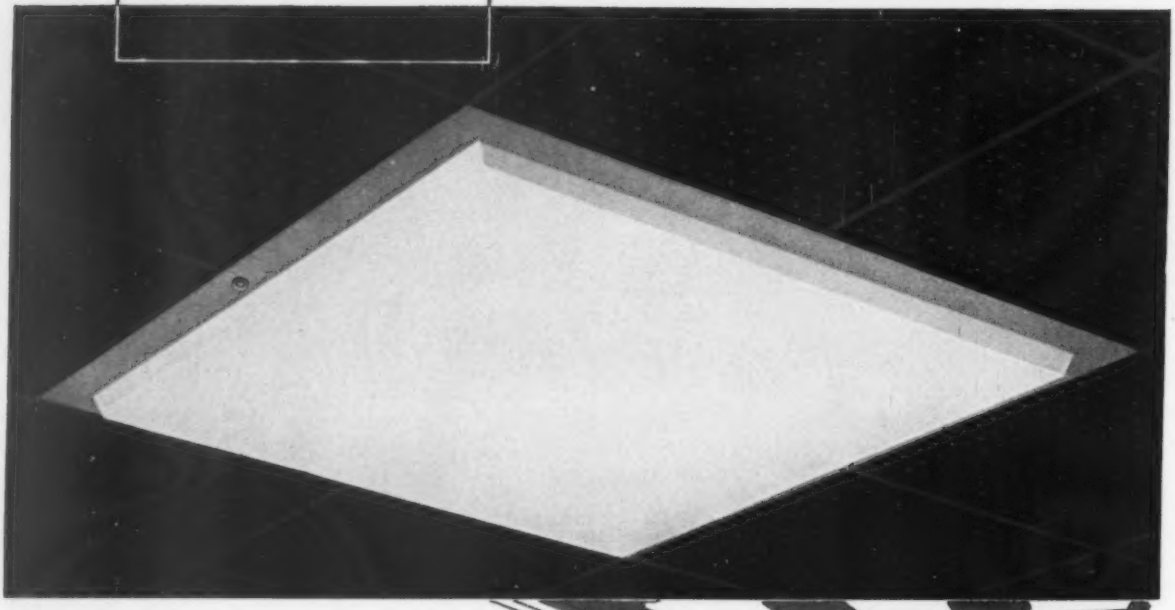

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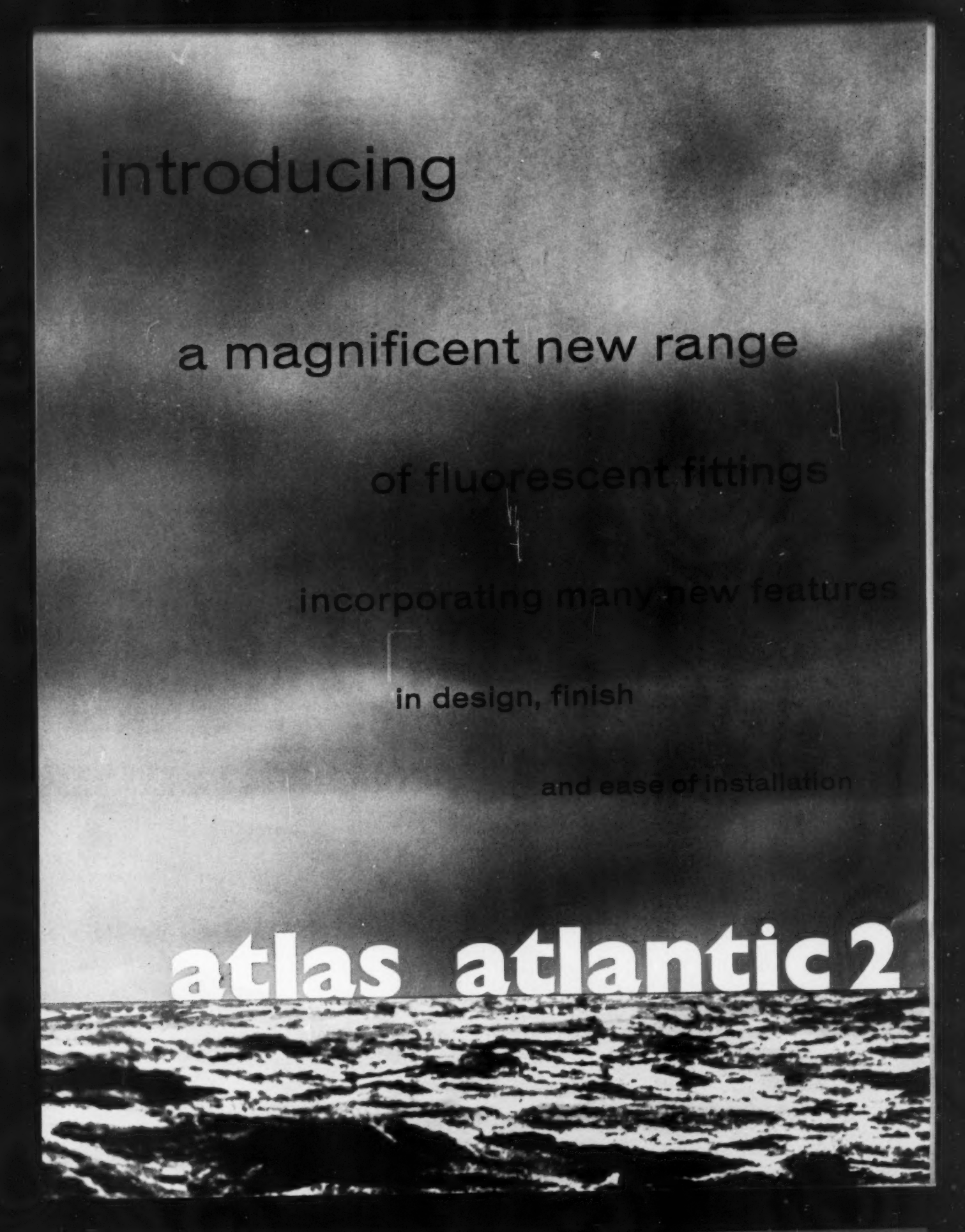
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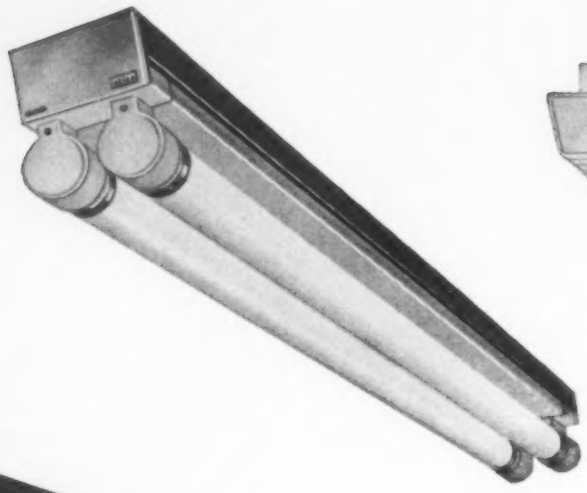
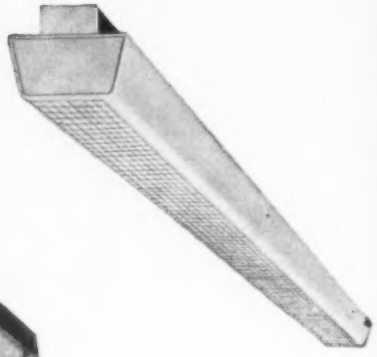
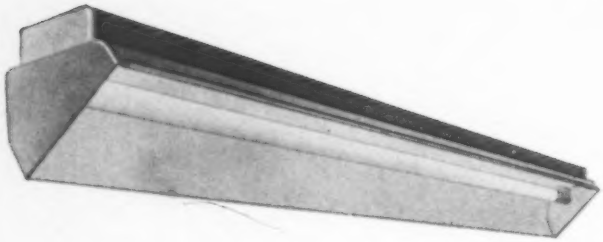
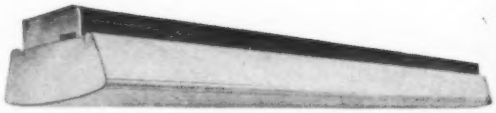
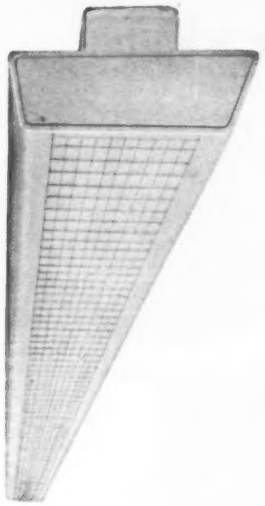
of fluorescent fittings
incorporating many new features
in design, finish
and ease of installation
atlas atlantic 2

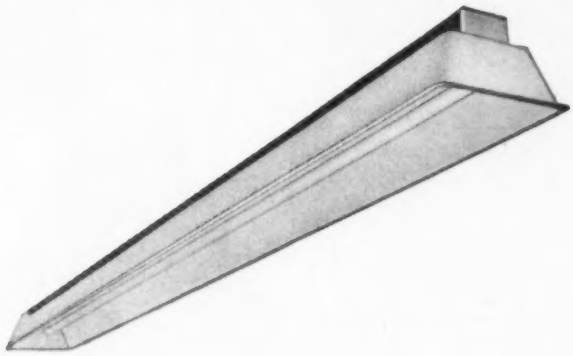






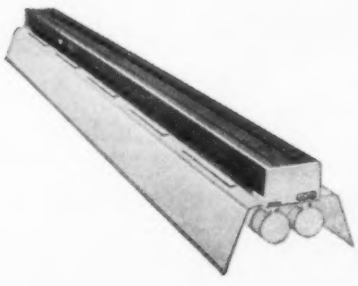


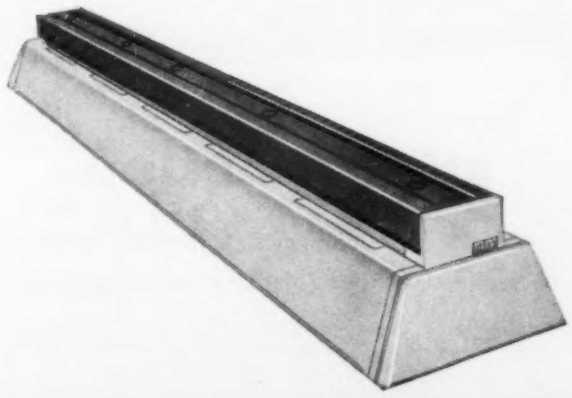




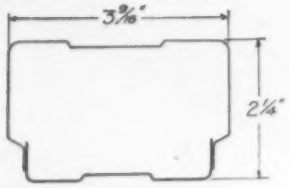
atlas atlantic 2

Here is a new complete family of fluorescent fittings, remarkable for outstanding appearance and a host of features with tremendous appeal on both practical and aesthetic grounds. They are built to the highest quality standards, yet offer surprisingly competitive prices. A unique spine of new slim section provides exceptional ease of installation, simple maintenance and reliability. The flexibility of this range is such that, from the one basic spine using the minimum number of interchangeable components, a wide variety of fluorescent fittings can be created to meet the precise lighting needs of almost any commercial, municipal or industrial premises. Fitting sizes cover 4 ft., 5 ft., and 8 ft., with single or double tubes, a choice of switch – or quickstart control gear, and reflector and diffuser attachments. Included in the range are fittings which accommodate the new Atlas 'Super-8' Circuit. For details of the unique design features of the Atlas Atlantic 2 spine, please see overleaf . . .

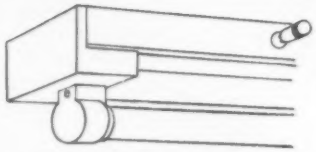




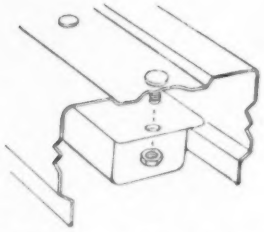
features of the new atlas atlantic 2 spine



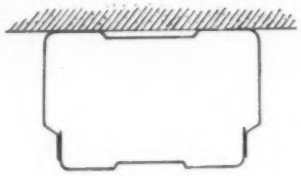
Slimmer section with more pleasing proportions.



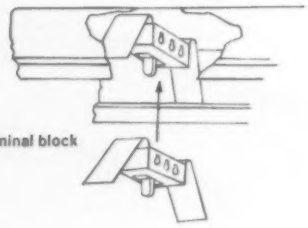
Starter switches replaceable without dismantling. Fixed voltage gear increases reliability.



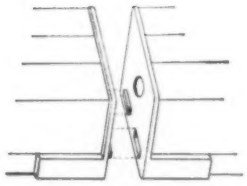
Welded screw studs for easy gear replacement



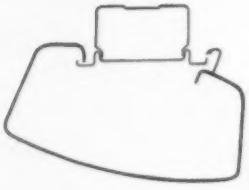
Completely closed back, drip and dust proof. Perfect seating when flush mounted.



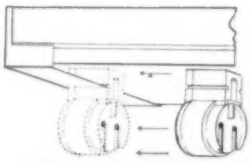
Snap fit terminal block



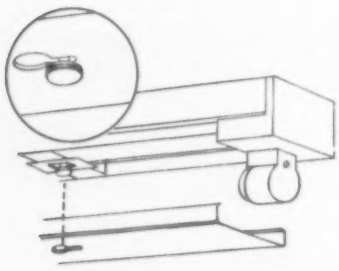
Automatic alignment when mounted in continuous runs. Rugged cast end plates.

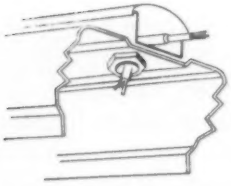


Fast, positive fixing of attachments

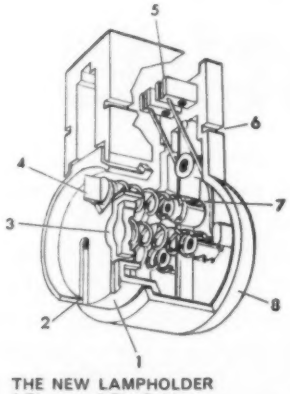


Improved lampholders, need no fixing, no screws





Enclosed through-wiring channels (Optional Extra)



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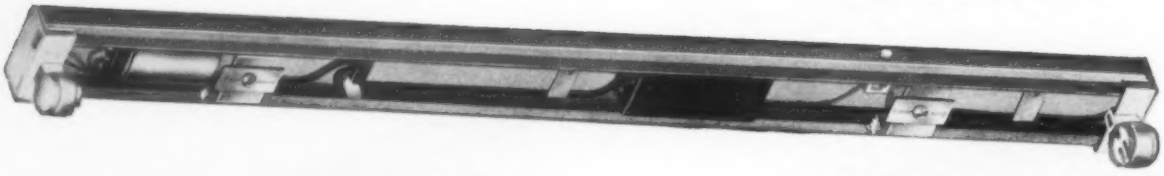

Single component chassis, pre-wired ready to install. Finest 'Miracryl' finish superior to stove enamels and with advantages over vitreous enamels

atlas atlantic 2

Complete details of this outstanding new range can be seen in the Atlas Atlantic 2 catalogue, available on request to

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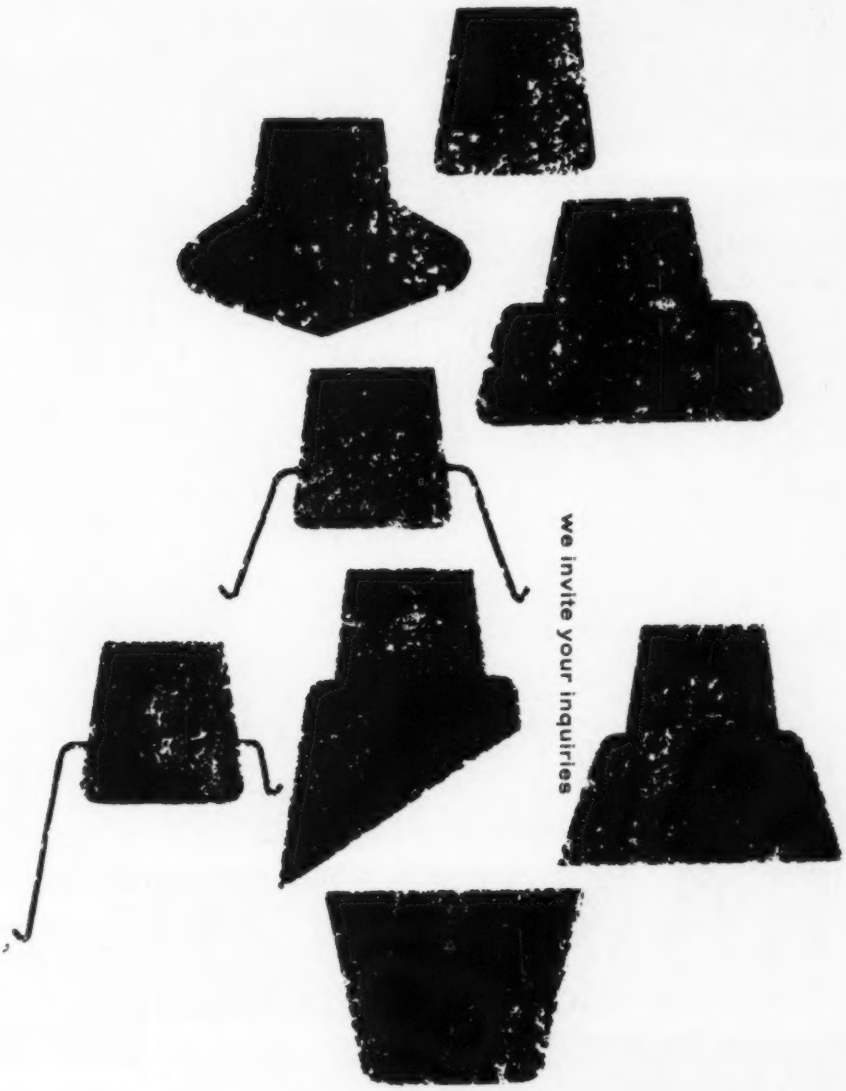
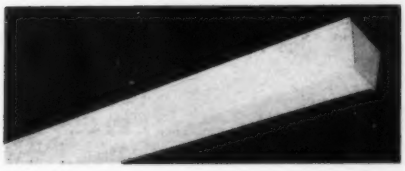


we invite your inquiries

SPERRIN



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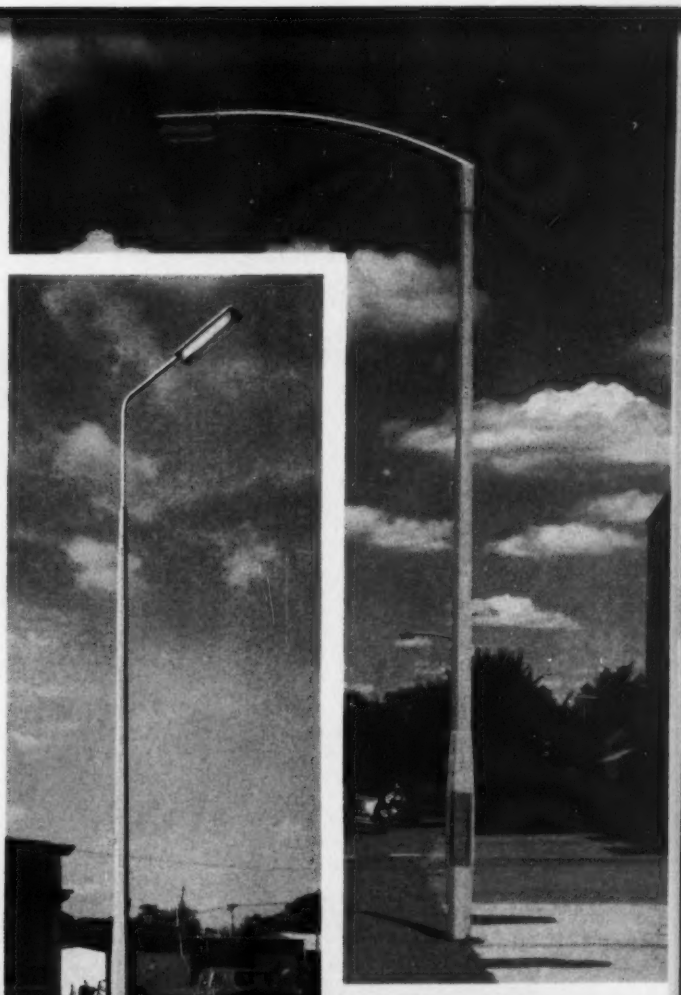

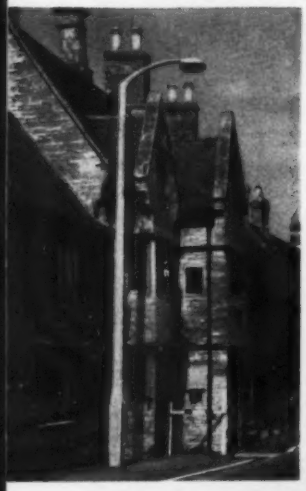

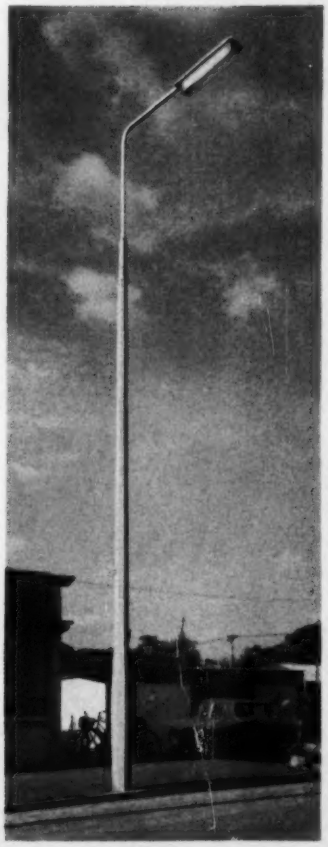

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COLUMNS

LIGHTING

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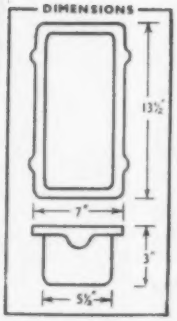
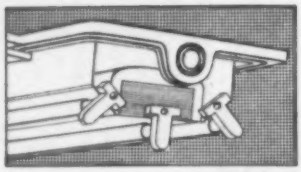
Major

Weatherproof Triple Tube Fluorescent Bulkhead Fitting

Cat. No. S.3107
(Switch start only)





The Fitting is designed so that one, two or three tubes can be separately switched for variations of lighting intensity.

(If Fitting is required with only 1 or 2 tubes instead of the standard 3-tube arrangement, a reduced price will be quoted on application.)

Suitable for—

Stairs

Passageways

Public Conveniences

Telephone Kiosks

Warehouses

Cellars

Garages, etc.

This versatile Bulkhead Fitting is suitable for mounting on either wall or ceiling, for indoors or outside, as required, being dust-tight and weatherproof.

The translucent perspex cover fits on a gasket snugly grooved in the alloy base casting, which carries 3 sets of holders to take the fluorescent tubes each 12 in. 8 watts (see sketch).

The fitting is provided with conduit entry at both ends, and (if stated when ordering) can be arranged to have a back entry to suit a standard B.E.S.A. box.

At present the fitting is made in one size only, to the dimensions shown in sketch above.

The long life (5,000 hours approx.) fluorescent tubes have the merit of needing only infrequent replacement, which renders the fitting particularly suitable when fixed in inaccessible positions.

Makers of Fluorescent Fittings & Stage Lighting Equipment

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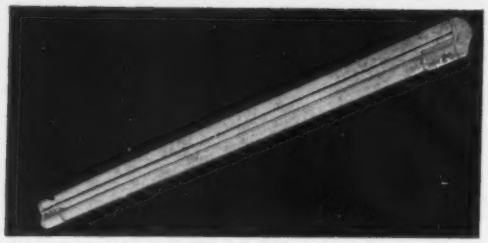
G.F.C.

It makes sense to



Batten fitting, fully enclosed STAR spine with slots and keyholes for easy fitting. Tapped silent control gear. Individually packed in stout carton.

			SS*	QS
STAR 15	Single 5′	Retail	£3 0 0	£3 18 0
STAR 25	Twin 5′	Retail	5 13 4	7 6 8
STAR 18	Single 8′	Retail	5 10 0	7 10 0
STAR 28	Twin 8′	Retail	8 10 0	13 10 0

* *Tapped* 220/250v.

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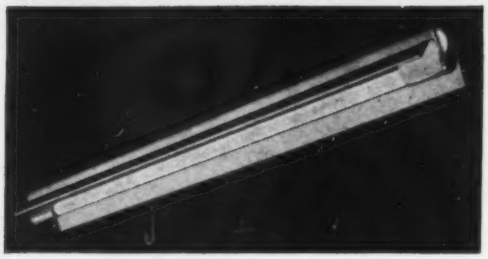

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			SS*	QS
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HOOD 25	Twin 5′	Retail	6 19 8	8 10 0
HOOD 18	Single 8′	Retail	7 8 0	9 8 0
HOOD 28	Twin 8′	Retail	11 0 0	16 0 0

* *Tapped* 200/250v.

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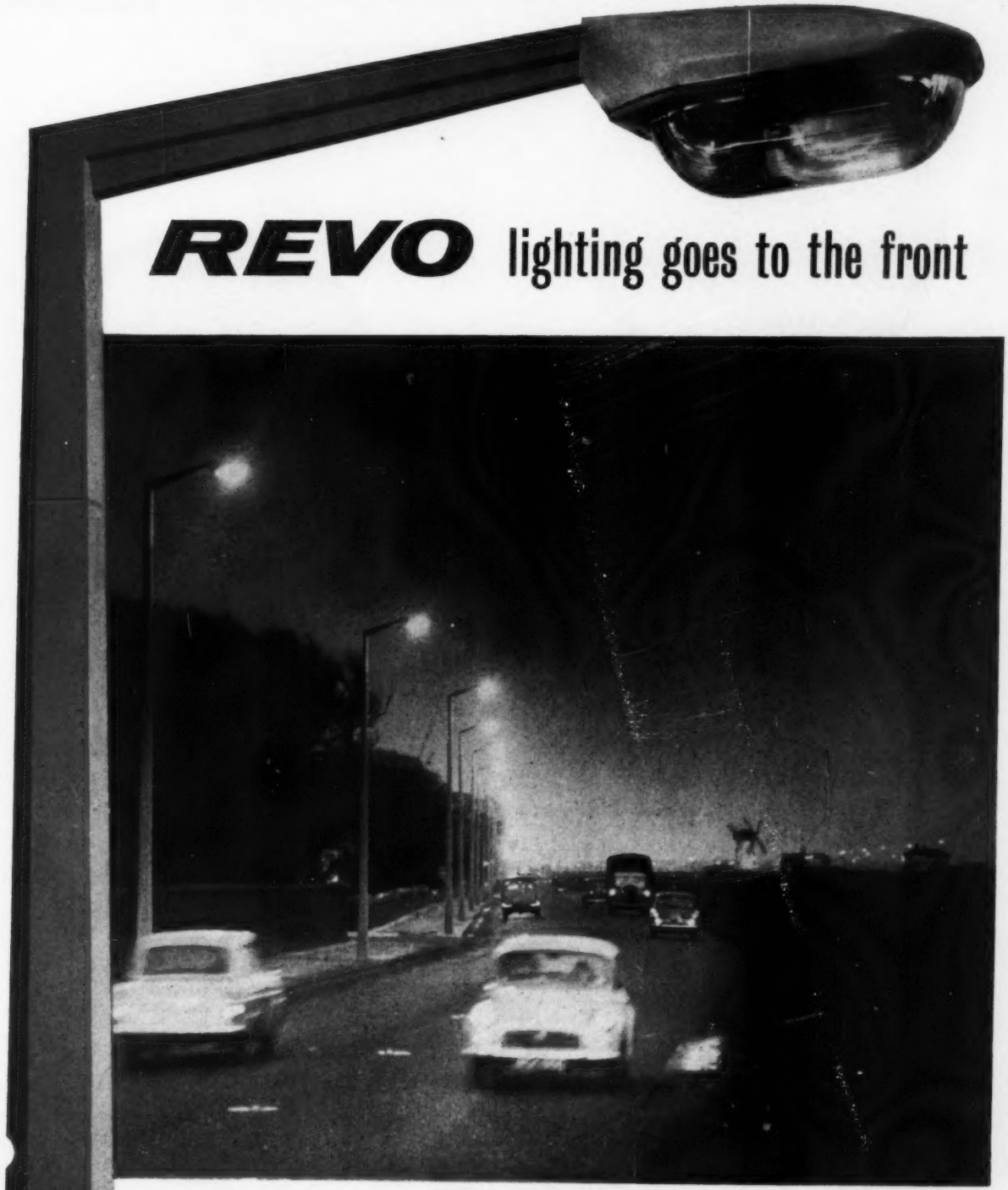

The Revo Horizon lantern illustrated here was used to light the front at Lytham St Annes. The effectiveness of the scheme can be appreciated from the photograph.

Photograph by courtesy of J. S. Mason, B.Sc.Eng., A.M.I.C.E., M.I.Mun.E., Borough Engineer & Surveyor, Borough of Lytham St. Annes.

The long sea front road at Lytham St. Annes is effectively illuminated by Revo Horizon lanterns. These lanterns consist of a high quality silicon-aluminium cast body finished in hammered grey stove enamel and have a pressed heat resisting glass prismatic refractor bowl sealed with a heat-, dust- and weather-proof gasket. They are designed for main road lighting using 250/400 w MBF/U Colour Corrected or MA/V Mercury lamps. Full information and advice on street lighting can be readily obtained from our experts.

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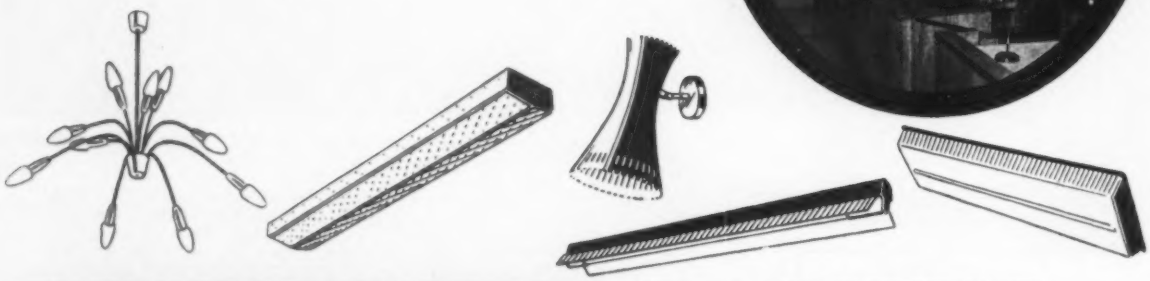

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Light and Lighting

CONTENTS

International Review of 1960: Report on developments in light sources and lighting equipment and on lighting installations in countries overseas based on information supplied by correspondents in:

Australia
Belgium
Canada
Denmark
Finland
France
Germany
Holland
Italy
Japan
New Zealand
Norway
Sweden
United States of America

The descriptive article (**pages 93—97**) is followed by 25 pages of illustrations which depict new luminaires and installations in streets, other exteriors, industry, offices, shops and stores, ecclesiastical buildings, sports stadia and gymnasia and other types of building interiors.

International Co-operation on Lighting Standardisation: Review by A. G. Penny of international organisations involved in making recommendations for standardisation with examples of the nature and outcome of their work (**page 125**)

IES Activities: London Sessional meeting—Centres' meetings—events (**page 128**)

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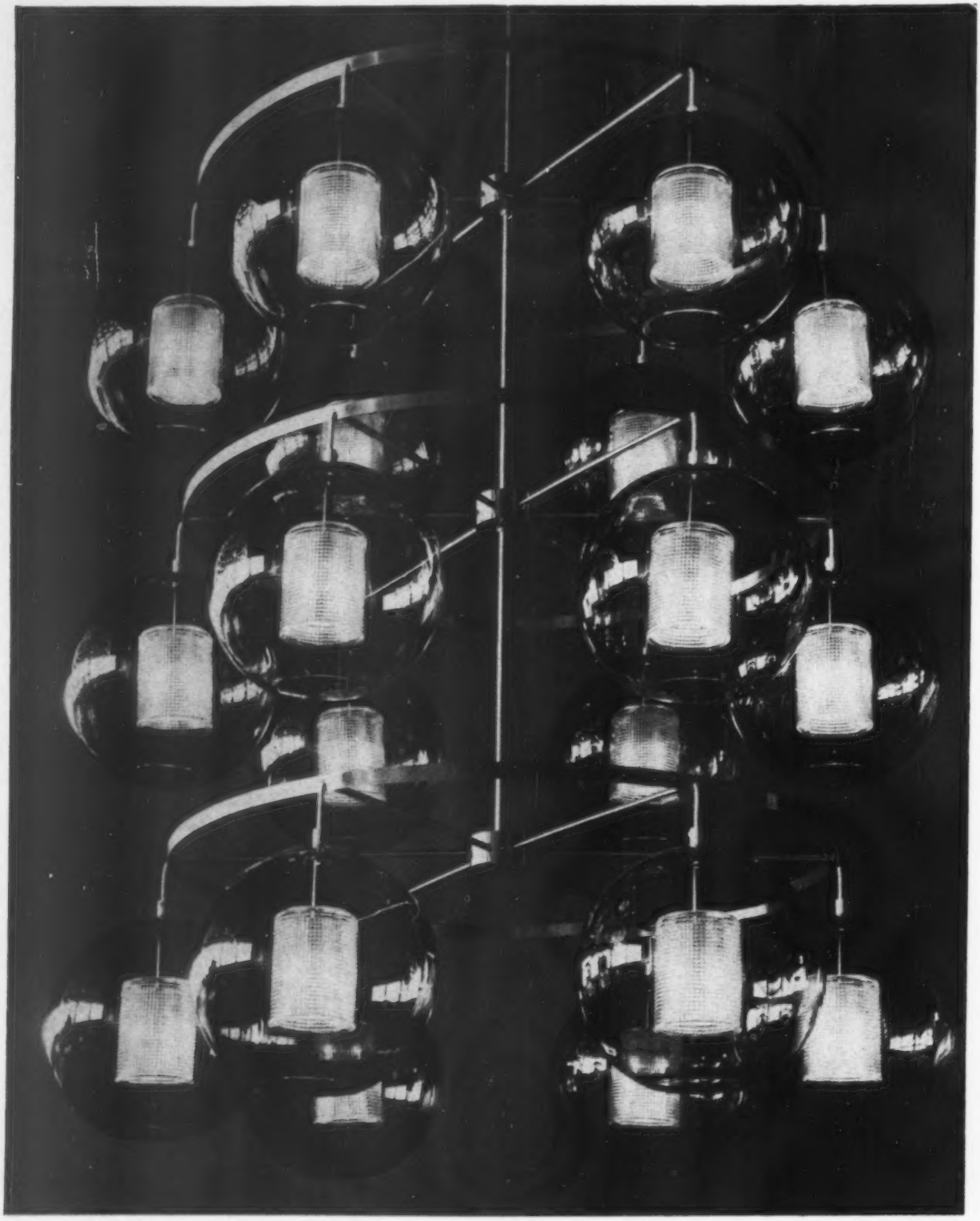
Postscript: by 'Lumeritas' (**page 132**)

Published by the Illuminating Engineering Society at 32 Victoria Street, London, SW1 (ABBey 7553). Printed in England by the Shenval Press, Simson Shand Ltd, London, Hertford & Harlow.

Motorway Lighting

In the discussion on the recent IES paper by J. M. Waldram on visual problems on motorways, the suggestion was made that no time should be lost in lighting a few miles of M1 so that some information could be obtained on the effect of lighting on accident rates on motorways. Last month Mr Charles Royle, MP, asked the Minister of Transport in the House of Commons if he would consider authorising the Road Research Laboratory to undertake a pilot scheme on the lighting of motorways. We regret to say that this suggestion received a very definite No—and in terms which indicate that the present Minister may never get any nearer to lighting motorways than he is today. His reply was: 'I see little practical advantage in having a pilot scheme since it is not my present intention to light rural motorways while heavily trafficked all-purpose roads . . . remain unlighted.' When, one may ask, are all heavily trafficked all-purpose roads in the country likely to be lighted? Apart from this, however, the Minister, with all respect, appears to have overlooked one matter of considerable importance, and which may well have been the point of the parliamentary question. In this country we know just about all there is to be known about lighting all-purpose roads; we would go so far as to suggest that there is no technical problem—it is a matter entirely of finding the money. But no one in this country has ever lit a motorway. The experts are agreed that the technical problems are different from those on other types of road. These problems will only be solved by experiment and in the light of experience; the limited experience of those countries where the importance of motorway lighting is understood only emphasises the need for experiments here. The volume of traffic using M1 and other motorways is increasing; the accident rate is also increasing. In a very short time the need to light motorways will be more obvious than it is now and sooner or later they will be lit. Why wait until all other roads have been lit before even considering how to set about lighting motorways?



Scandinavia has taken the lead in recent years in the design of lighting glassware of which the use by Carl Fagerlund of Orrefors prismatic cylinders with tinted spheres is the latest example (Lyfa, Copenhagen).

International Review of 1960

WHEN, IN OUR JANUARY ISSUE THIS YEAR, British lighting developments during 1960 were reviewed, the general conclusion was drawn that 1960 was a year of consolidation, of marking time. When we came to study the material supplied for our review of developments outside Britain, we realised, initially to our surprise, that the same conclusion applied. On reflection, however, we are not so sure that this seeming standstill in fundamental development is after all so surprising. The lighting world in the last few years has sustained a series of shocks in the form of dramatic new developments coming one after the other. The shocks have been delivered mainly by the lamp engineers—high-output fluorescent lamps, luminescent panels, 100 lm/w sodium lamps, 75kw xenon lamps, high-output filament lamps, decorative bulb filament lamps, and all kinds of lamps with some degree of optical control built in. In the midst of all these came the particularly violent shock from America, in the form of recommended illumination levels increased in certain cases by staggering amounts. It seems perfectly natural, then, that the industry should require breathing space to take it all in.

Another reason for this may be that in those technologically developed countries from which our information largely comes, most of the fundamental problems of lighting have now been solved; what remains are refinements in technique accompanied by a steady expansion in the application of good lighting to all situations. There seems to be considerable evidence to point to such an assertion, notably that emphasis has shifted from quantity to quality of lighting, in which glare, sparkle, brightness variations, aesthetic appearance and optical performance are inextricably bound together. The outcome, necessarily, of such a change is that the details of installation design come to assume far greater relative importance; the glare problem, for example, is unlikely to be solved in a single step of magnitude as dramatic, say, as increasing the efficiency of a sodium lamp by 25 per cent to 100 lm/w.

To assert that the fundamental problems have been solved is not to say that there is any lessening of the task facing lighting engineers; the facts suggest that the opposite is the case. As society becomes more sophisticated, as demands on the human individual at work become more exacting, as communications become more rapid, the lighting engineer has to ensure that the lighting in which people carry out their particular occupation, whether assembling a transistor or driving a lorry, enables them to do so with a minimum of distraction and that the lighting in which people spend their leisure hours enables them to relax sufficiently to refresh themselves for the return to work. This in turn involves careful consideration of all kinds of details.

The pages which follow reflect this greater attention to detail; the lighting in a Danish office for sorting football pool coupons is a particular example. But, in general, they are not markedly dissimilar from the corresponding pages in our April issue last year and this indicates that some change in presentation has become necessary to take account of the change in emphasis and to bring out more clearly the details of an installation which give it its character.

This Review is based on information supplied by

Jack Whittemore (Australia)
Andre Boereboom (Belgium)
R. W. Sclater (Canada)
Bent Knudsen (Denmark)
Esko Paivarinne (Finland)
Jean Maisonneuve (France)
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G. Hassel (Sweden)
T. D. Wakefield (USA)
A. W. Gostt (various countries)

LIGHT SOURCES

Outside Great Britain most developments in light sources come from Germany, the Netherlands and the USA. A great deal of work is done in the laboratories and lamp factories in those countries, one result of which is a steady stream of detailed improvements to existing light sources. From each of the three countries mentioned above we have received notes of many detailed improvements and developments which are too numerous to give here.

The two main developments during the year seem to be the introduction of the decorative bulb filament lamp and the iodine-quartz filament lamp. The decorative type lamp appeared in a number of countries early in the year; the main point about it is that by using bulbs of different contours attractively shaped lamps are produced which need no fittings or shades. Fittings designers have lost no time in taking up this lamp and some examples of their efforts are shown on page 98.

A number of technical papers recently have discussed the improvements in lumen maintenance and lamp life which can be expected from the introduction of iodine into certain types of tungsten filament lamp. The presence of iodine reduces the net rate of evaporation of the tungsten filament and so far the small bulb sizes obtainable with quartz seem to present the best operating conditions. During the year such lamps came on to the market and on page 116 are shown two luminaires in which a quartz iodine lamp is used and a dog-racing track lit by this means. In the USA, 500 and 1,500w lamps are available—their efficiency is 21–22 lm/w with a life of 2,000 hours. The conditions under which these lamps must operate (within four degs of the horizontal in order to keep the iodine uniformly distributed throughout the lamp) limit, for the time being at least, their application. There are, however, small sizes which can be held in any position though they are not as efficient as the larger sizes. (One of the possible uses of the iodine quartz lamp, as L. J. Davies mentioned in his IES Jubilee lecture [IES Transactions, **25,** No. 1, 1960] is with oxygen regeneration equipment—which may enable man to travel in outer space or beneath the sea for indefinite periods of time—as Mr Davies said, 'an appalling prospect'.) Very little is being said at the moment about the very high output and 'power groove' filament lamps which made their bow two or three years ago. We gather that in the USA they are now the main lamp for use in high 'foot-candle' fluorescent installations; as—we are told—the higher level installations are growing in number every day then the number of lamps in use must also presumably be growing.

The Skandinavisk Lysrors Fabrik in Copenhagen, which manufactures 'slim line' tubes, introduced their new circular lamps (505, 605 and 705 mm diameter) during the year and a rectangular lamp having a total tube length of 8ft. From Germany comes news of a 200w sodium lamp with a luminous efficiency of 107 lm/w (presumably initial) and developments with xenon lamps including the introduction of new 1,000 and 2,000w water-cooled types and life improvements of up to 1,500 and 3,000 hours for certain projector type xenon lamps.

Electroluminescent plates in various standard sizes operating on 220v, 500 c/s are now generally available in Germany; they give a luminance of about 1—2 ft-L with a luminous efficiency of 2—3 lm/w, which values can be increased to about 10 ft-L and 8 lm/w by operation at higher frequencies. In the USA flexible versions are now available. They are in the form of sealed plastics panels 0·30 in. thick and operate at 120v, 60 c/s giving from 0·8 to 9·5 ft-L depending on the colour. We note that since 1950 Sylvania have produced more than 10 million of their electroluminescent 'Panelescent' lamps which we put to a variety of uses including such things as switch plates which are energised when the main lighting is off and switched off as the main lighting is switched on. These 'Panelescent' lamps can also be assembled to form outdoor signs and one of the advantages of such a sign is said to be that it will continue to operate even after being punctured by rifle bullets—an advantage no doubt in those places where it is the habit of the populace to take pot shots at signs.

There have been two reported applications of high-power xenon lamps and both come from the Osram Company in Germany. The first is for a 65 kw lamp outside the Berlin Zoo station and the other is of the largest xenon lamp so far, a 75 kw lamp, in front of the railway terminus station in Rome where it was installed for the Olympic Games. The 75 kw lamp is 9 ft 11½ in. long, just over 2 in. in diameter and has a light output of 2½ million lumens.

LUMINAIRES

A selection from the large numbers of pictures of luminaires which were submitted is given on pages 98–99 and one has been selected for the frontispiece on page 92. Many other luminaires will be seen in the pictures of lighting installations. Last year we found it necessary to refer to luminaire design activity in Denmark; again this year we find that, after selecting (without looking at the country of origin) pictures to be reproduced, Denmark again has a majority. Our correspondent in Copenhagen says that from a lighting engineer's point of view there is not much 'new' in these luminaires —he even goes so far as to imply that the Danish architect-designers feel obliged to produce new models each autumn. This might be so, but if it is, then the indications are that fashion in lighting fittings is more comparable with changing fashions in women's clothes rather than with say, the car industry where change is so frequently introduced for the sake of change alone resulting in bad rather than good design.

A design which deserves special mention is the luminaire designed by W. Allen Smith for the St Paul's Chapel at Sydney Univeristy. It consists of two hand-beaten silver bowls with a mounting bracket of satin aluminium; the upper bowl houses three 150w krypton-filled filament lamps and the lower one three 60w krypton lamps. Each bowl has a dished 'Perspex' cover. A picture of the luminaire is shown on page 99 and the interior of the Chapel in Sydney is shown on page 114.

The dentist's fitting shown on page 99 was designed and made in Denmark because of the high cost of imported fittings. The designer's brief was to construct a fitting which at a distance of 3 ft would give 500 lm/ft² in an area 3 in. by 6 in. To avoid the high tooling costs for making optical glass, Poul Henningsen relied on an optical system using four ellipsoidal spinnings and louvers and achieved the required results at a low cost. The light source is a half-silvered 12v, 75w tungsten lamp; the fitting is open and air circulates between the reflectors keeping the lamp and fitting cool.

Until recently, the recessed fluorescent troffer was not popular in Australian offices due to the excessive brightness contrast between the lamps or reflecting surfaces and the ceiling. This situation has now changed due to higher levels of illumination (50 lm/ft² rising to 100 lm/ft² in some offices) and to the swing towards white rather than coloured ceilings. A great deal of new office building is going on in Australia and the recessed troffer is now the normal method of lighting.

EXTERIOR LIGHTING

Public interest in street lighting and appreciation by public authorities of their responsibilities in this field continued to grow during 1960. This appears to be general throughout the world and each country is anxious to be kept informed of new work, new accident statistics and other relevant data from elsewhere.

The improvement of street lighting demands a co-operative effort from the many interests involved. An example of this comes from Australia. Growing concern over traffic accidents, increasing evidence of the life-saving potentialities of good street lighting and the efforts of an IES of New South Wales committee led to a comprehensive report to the NSW Minister for Local Government and Highways on how to solve the street lighting problem in the State. A widely representative group, sponsored by the Electricity Authority of NSW and assisted by the Standards Association of Australia, scientific and trade organizations and government agencies, examined documents and reports from other countries, conducted full scale night tests on the new anti-skid road surfaces, analysed the problems of finance and administration, studied the correlation between night accidents and street lighting, evolved a plan of construction for minimum safety and compared the expenditure involved in the plan with the estimated savings in life, injury and damage on traffic routes throughout the State. This sounds like a pretty heavy task—we hope records will be kept to show how far practice confirms the theoretical studies of the committee.

We note that in Belgium the Minister of Public Works is now empowered to light up to 50 km of traffic routes each year—and pay for it out of government funds. This is generally welcomed, particularly by local authorities, as a step towards continuity and uniformity in the lighting of these main roads.

For Italy, 1960 was a very busy year in street lighting as in many other things. The holding of the Olympic Games in Rome gave a good excuse for getting quite a lot of jobs done including the installation of over 10,000 colour-corrected mercury lamps.

Some of these installations have already been described (*Light and Lighting* **53**, 303–4, 307–8, November 1960) including the station square in Rome and its 75kw xenon lamp, the Corso Francia viaduct over the Olympic Village lit by 3,000 15w fluorescent lamps and the approach roads to the Olympic Village. In France the most important street lighting job during the year was probably the Autoroute du Sud which is an important motorway carrying heavy traffic and including interesting problems of underpass and tunnel lighting. Illustrations are given on page 100 of one of the road junctions lit by 400w colour-corrected mercury lamps (from what in daytime must appear to be a forest of poles—known, we believe, as the Forêt d'Orly), and the underpass at Orly where some 2,400, 140w sodium lamps are used in special mirrored fittings to give an illumination of 6–12 lm/ft² inside the tunnel; special louvers are used to bring about a gradual change from daylight at the entrance to artificial light inside the tunnel. On page 102 is a picture of another tunnel which is lit by fluorescent lamps augmented by sodium lamps at the entrances.

The lighting of motorways and highway intersections is one of the subjects which has been receiving attention in Germany. One example is a highway near Düsseldorf (see page 100) where seventeen 130-ft steel columns, each with six 10-ft bracket arms, have been erected to light a triangular intersection each leg of which is 650 ft long. Each bracket supports a luminaire housing a specular reflector and two 400w colour-corrected mercury lamps and one 200w sodium lamp, giving a power of 7kw and a light output of 360,000 lumens per column. Road surface brightness under both night and day conditions and visibility are said to be good; the road surface illumination varies between 1 and 4 lm/ft². A conventional installation of 30-ft columns would have called for between 300 and 350 single columns. This outstanding installation was planned with the aid of a $\frac{1}{8}$th scale model, i.e. with columns 26 ft high. Only part of the scheme was laid out as a model but this was sufficient to enable the idea to be tested and for the lighting of the whole intersection to be planned.

Previous reviews have included a fairly large section or sections dealing with floodlighting and other exterior lighting applications and usually we have been able to include quite a number of attractive pictures. This time the total material on these two sections included only one floodlighting installation of the spectacular type (the Château du Lude in France) and no picture at all of other decorative outdoor lighting; the remaining pictures were of industrial plants or strictly business-like lighting installations. This is quite a swing from decorative to functional and one wonders whether the lighting engineer is now being asked to put some of the techniques he has applied for spectacular purposes to more practical use. The types of installation which were included in these sections were a coal harbour, oil refineries, canal locks, a nuclear reactor site and a sewage treatment works; all intensely practical and equally ugly.

INDUSTRY

The higher recommended illumination levels introduced a year or two ago in the USA appear to be finding wider acceptance and examples are quoted of increases in productivity of up to as much as 50 per cent with other benefits such as decrease in spoilage and better internal economy. Illumination levels of 120, 250, 1,000 lm/ft² are mentioned in such cases—though the illumination before relighting is seldom quoted. The high output fluorescent lamp is naturally of great value in obtaining these high levels of illumination though the colour-corrected mercury lamp also appears to be making a contribution. Amercian influence is, of course, felt across the border in Canada where these high intensity installations are also to be found in factories and offices. One Canadian spokesman has pointed out once again that improvements in lamp efficiency coupled with improvements in the production and distribution of electricity make the achievement of today's 150–250 lm/ft² no more proportionately expensive than the 3–5 lm/ft² of fifty years ago. He also quotes typical Canadian production costs per man hour as follows: $7.00–10.00 for plant and equipment; $2.50–3.70 for labour; 2 cents for a poor, and 4–6 cents for a good lighting system.

He points out that the hourly cost per 10,000 ft of good lighting is less than the hourly wage of a janitor but deplores the fact that even some people in the lighting business are unaware of these facts or do not appreciate the tremendous advances made by the industry; an urgent need of the industry, he says, is more trained people who can tell the lighting story. May we not be misunderstood if we say that we thought our

North American colleagues pretty good at telling the lighting story—have the last two years been only a warming-up period for what is to come? However, it is true and cannot be denied that we (lighting people in general) have still to sell the benefits of good lighting to industry as a whole (and with 'industry' we include 'offices' which are every bit as deserving of good lighting but are less likely to have it). As far as industrial lighting practice is concerned there does not appear to have been any significant change during the past year or so and pictures of 1960 installations look very much like those of 1959. The situation with office lighting is more or less as it was last year; it seems harder to sell good office lighting than good industrial lighting and therefore the emphasis is still for the time being on public offices (prestige installations) and executive offices (if the boss can be convinced that he must have good lighting then it will be easier to persuade him that his staff need it). With rising levels of illumination the problem of glare is becoming more acute in offices, particularly reflected glare from work surfaces. An example of this comes from Denmark where young ladies employed to check football pools coupons use a plastic mask which has holes cut in it to indicate the results of the games and which is placed over each coupon; experiments with several forms of lighting, including totally indirect and a luminous ceiling, failed to cure reflected glare from the plastic mask. The special lighting system eventually installed (see page 110) incorporated recessed parabolic mirrors so that all the light falling on the tables came at an angle and was therefore reflected away from the checkers' eyes. An innovation from Australia intended to overcome the switching problems which arise in installations planned for flexible layout and partitioning is a ceiling push switch; this is located next to a ceiling fitting and is operated by a rod from the floor.

SPORT

The 1960 Olympic Games in Rome gave the Italians a first class opportunity to show what they could do in the way of lighting for many sports and they did not fail to rise to the occasion. Many of us were able to watch most of the events on television and were able to see for ourselves how well many of the stadia and arenas were lit. The standard of lighting achieved was remarkable when one recalls that only five years ago no stadium in Italy had a lighting installation. The Olympic Stadium in Rome incorporated two installations on four 200-ft towers, the first being of 240, 1,500w floods for football and giving 30 lm/ft², increasing to 55 lm/ft² with 20 per cent overrunning of the lamps, the other being of 160, 500w projectors giving 15 lm/ft² on the running track. The Flaminio Football Stadium, designed by Nervi, also had a four-tower installation the height in this case being 170 ft and the projectors being again 240, at 1,500w. The two pools of the swimming stadium were lit by 76, 1,500w floodlights and 40, 1,000w underwater floods. A further football and athletics stadium was that of Naples—Fuorigrotta where the lighting was carried out by Ugo Pollice using 300, 1,500w floodlights on four 160-ft towers giving an average illumination of 40 lm/ft². During the year more than a dozen important stadia were floodlit in Italy. Most of the other sports applications which came to our notice were of lighting for indoor tennis courts, all the examples of which came from European countries—other countries perhaps having climates which make indoor practice unnecessary. Mention must again be made of the use of the quartz-iodine filament lamp in compact projector units for track lighting, the example of which is shown on page 116.

The foregoing, then, indicates some of the developments overseas in 1960 and these are illustrated in the following pictures. They portray a growing international conformity in which certain countries have taken the lead in particular aspects; there seems to be no question, for example, that Scandinavia is still the most advanced in tungsten decorative luminaire design, that Germany has scooped the pool in xenon discharge lamps, that America occupies a similar position in respect of iodine-quartz lamps and that Great Britain appears to have few equals in fluorescent luminaire design. These conclusions apply, of course, only among those countries from which we hear; it is a matter of particular disappointment to us that some countries apparently prefer to remain silent on their lighting achievements even though they are invited each year to contribute. To those who have contributed, however, we express our thanks for the considerable time and effort they have expended in collecting information.

LUMINAIRES

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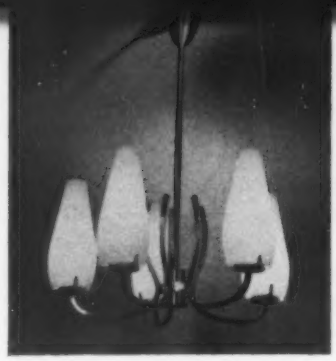
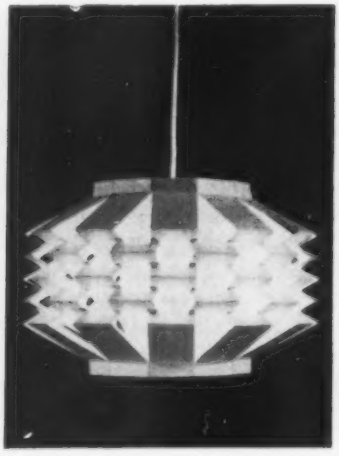
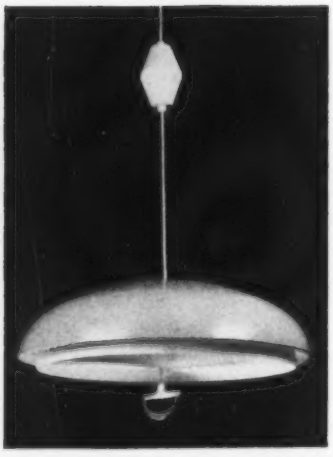
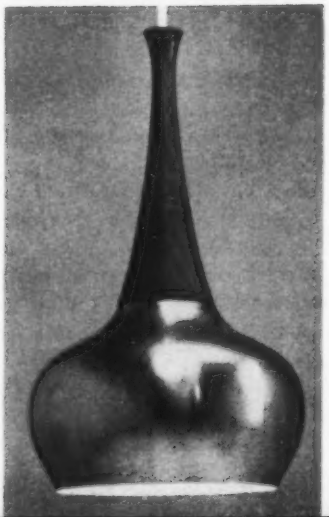


(1) Pendant fitting, typical of present Australian trends in luminaire design using delustered opal glass and satin brass metalwork (designer, W. Allen Smith). Compare this with (2) where a similar effect is obtained using the new style of decorative filament lamp (Philips, Brussels). (3, 4) Two office desk lamps (Philips, Brussels).

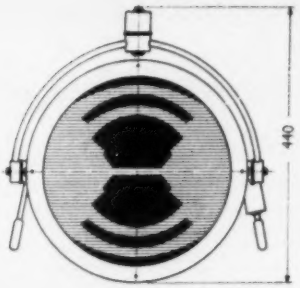


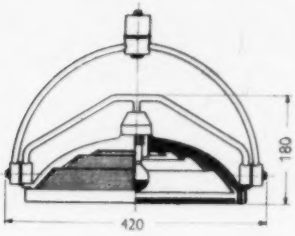


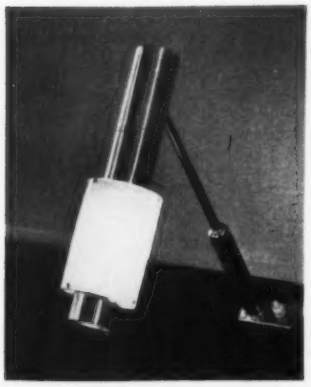
(5) Another example of the use of the new style of decorative filament lamps, in this case for a table lamp (Philips, Brussels). Four pendants illustrating modern Danish styles: (6) designed by B. Winding and James Wright using stove-enamelled aluminium (Ernst Voss, Fredericia); (7) louvered rise and fall type designed by Viliti Wohlert and Jergen Bo (Louis Poulsen, Copenhagen); (8) open-base sphere of polished aluminium by Verner Panton (Louis Poulsen, Copenhagen); (9) inverted 'wine glass' pendant, with teak stem and copper bowl (Lyfa, Copenhagen).

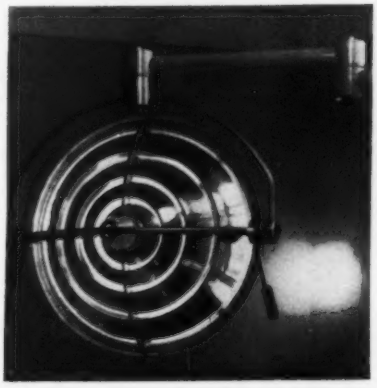


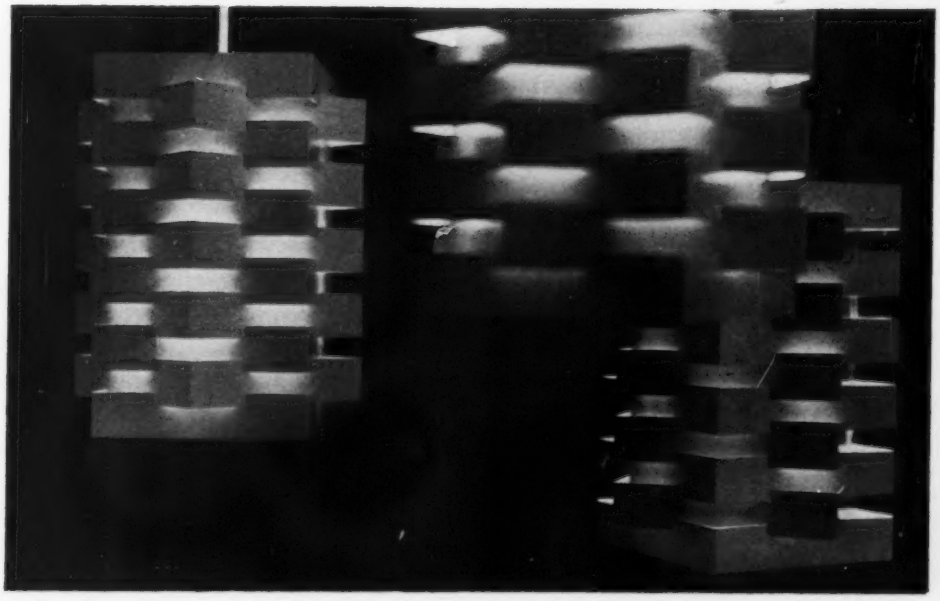
(10) Movable bracket designed by Arne Jacobsen used in bedrooms of the Royal Hotel, Copenhagen; it can be slid along the specially formed dado rail which conceals the wiring. (11) New type of dentist's surgery fitting designed by Poul Henningsen using the ellipsoidal spinnings shown in the diagrams (Louis Poulsen, Copenhagen). (12) Group of aluminium stove-enamelled pendants designed by Hans Jensen and Neils Esmann (Nordisk Solar, Copenhagen). (13) Pendant using multi-coloured reflectors designed by Einar Mielby (Ernst Voss, Fredericia). (14) Wall bracket utilising hand-beaten silver bowls to give upward and downward lighting, designed by W. Allen Smith for St Paul's Chapel, Sydney University.

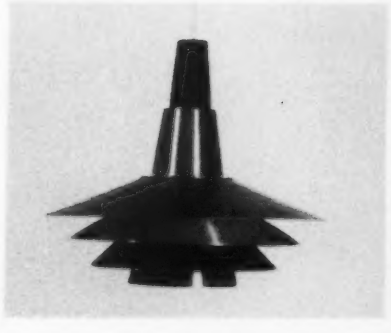


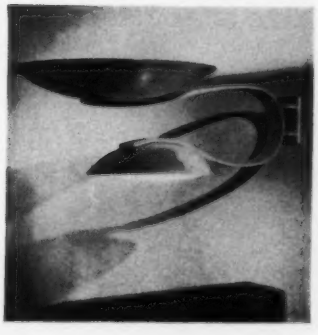












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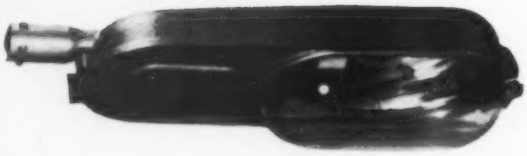
STREET LIGHTING

Above, looking down the Orly underpass near Paris in which 2,400 140w sodium lamps in special mirrored fittings and a system of louvers give a gradual transition from daylight conditions to the darker tunnel interior. Left, view of the approach to the underpass by night (Philips, Paris). Below left, highway intersection near Dusseldorf lit from seventeen 130 ft steel columns each supporting six lanterns; each lantern houses one 200w sodium and two 400w mercury lamps (Hellux, Hanover and Philips, Hamburg). Below right, throughway at Wuppertal, lit by 400w and 700w colour-corrected mercury lamps mounted at 73 ft on steel columns (Philips, Hamburg).

Right top, view of two installations at Tauranga and Invercargill in New Zealand; the first is of colour-corrected mercury lamps on metal brackets attached to concrete columns and the other uses 15 ft bracket arms of local design and manufacture (British GEC, Wellington). The lower pictures right show the columns used in the installation at Wuppertal (see facing page) and an installation of fluorescent lanterns (two 30w tubes) on whip-type columns at Dilbeek, Belgium (ACEC, Charleroi). Below left, the Orly junction on the Autoroute de Sud lit by 400w colour-corrected mercury lamps mounted at 40 ft on steel columns inclined towards the carriageway (Compagnie des Lampes, Paris). Below right, decorative lighting columns in front of the Gelsenkirchen theatre; the eight lanterns each house a 400w mercury lamp and are mounted on a 28 ft column. The lantern consists of a metal ring supporting upper and lower acrylic plastic bowls either of which may be moved for lamp access (Zeiss Ikon, Berlin).

STREET LIGHTING
(continued)



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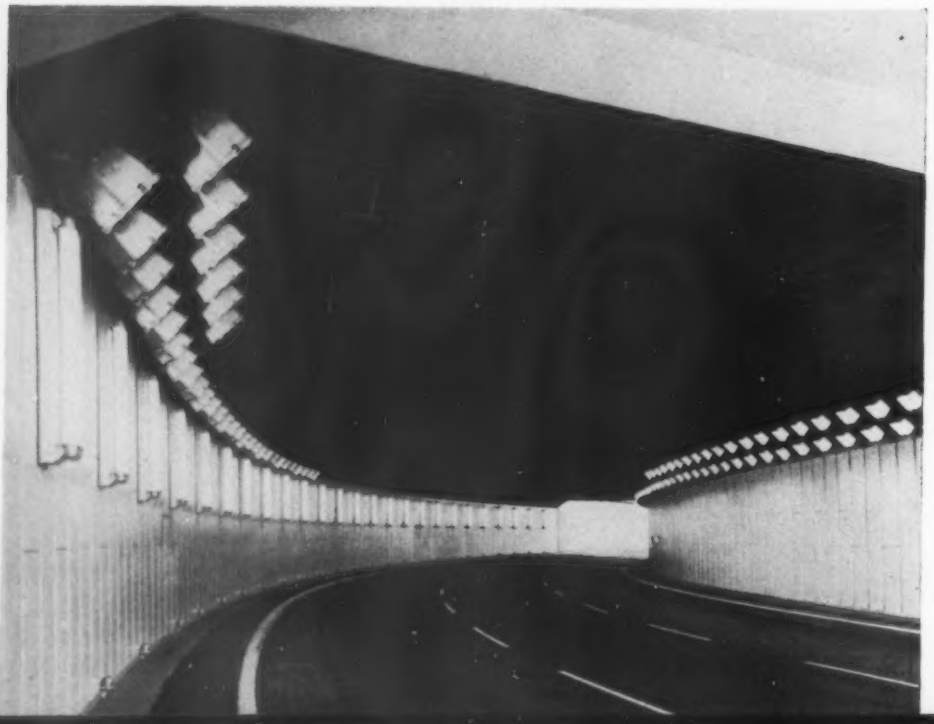
(1) Wall-mounted prismatic lantern for use with 300w filament lamp or 175w mercury lamp (Holophane, New York). (2) Lantern housing one 65w fluorescent tube for handrail mounting; light flux is controlled by a specular reflector and louvers to give maximum output 10° below the horizontal (Siemens Schuckert, Erlangen). (3) Decorative wrought iron lantern designed to match the architectural style of the buildings at Castell 'Arquato (Piacenza) (Soc. Emiliana Esercizi Elettrici, Piacenza). (4) Cut-off lantern for 125/250w colour-corrected mercury lamps or 85/140w sodium lamps (ACEC, Charleroi).



Above, 42-in. twin-lamp fluorescent fittings built into the parapet of the Manahawk Causeway Bridge, New Jersey, arranged at a mounting height of 50 in. (General Electric, Schenectady). Left, one of the four tunnels on the Autoroute du Sud lit by vertically mounted fluorescent fittings supplemented at the entrances by sodium lamp lanterns (Compagnie des Lampes, Paris).

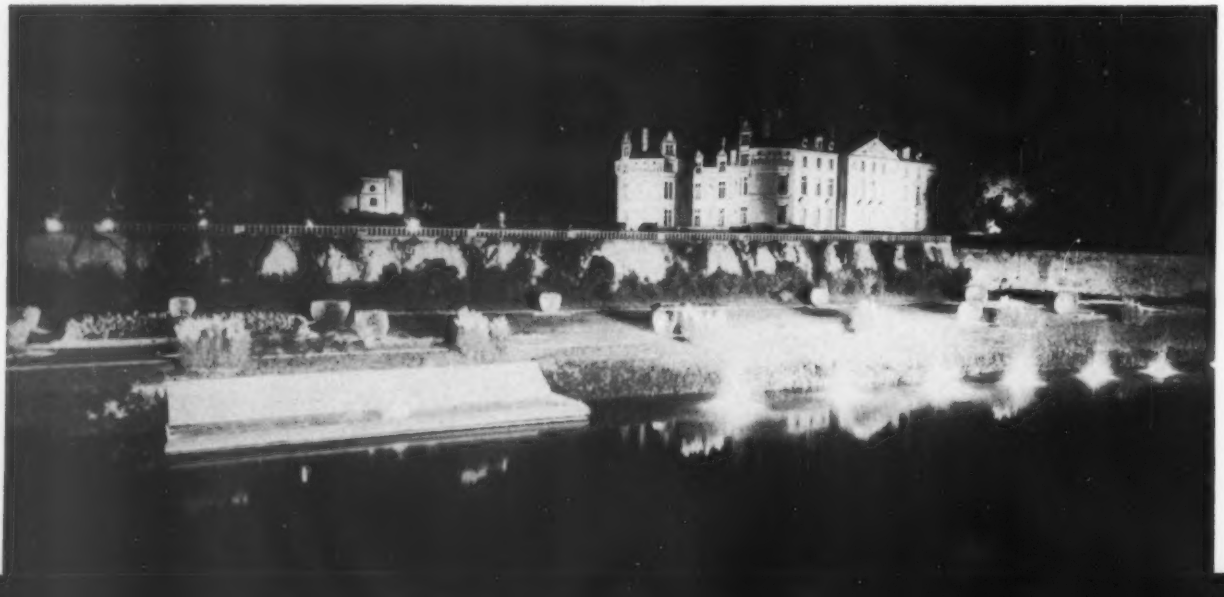
Top, the new coal harbour at Naantali, Finland, lit by 400w colour-corrected mercury lamps mounted in groups on 100-ft towers. Centre, one of the batteries of 2,000w filament lamp projectors used to floodlight the Volkswagen offices at Wolfsburg (Philips, Hamburg). Below, installation of 300w post-top lanterns at the Auckland sewage treatment works (British GEC, Wellington).

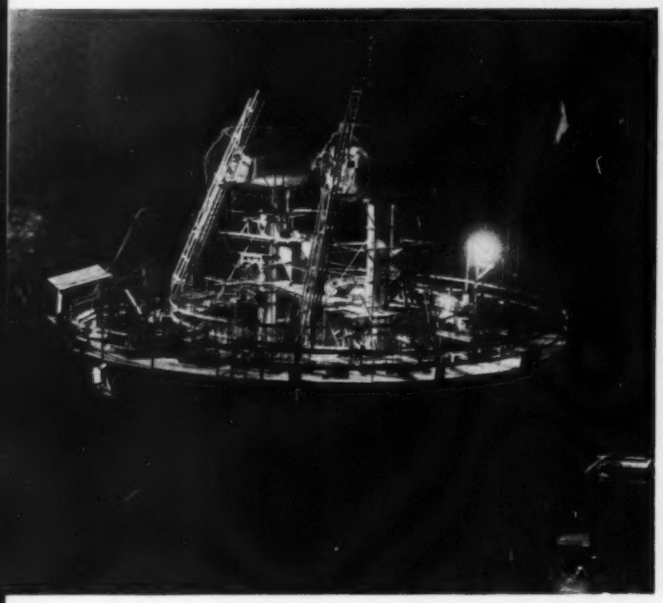
OTHER EXTERIOR LIGHTING

OTHER EXTERIORS (continued)

Top, effective lighting of an outdoor industrial plant in France from high-mounted projectors not shown in the picture (Compagnie des Lampes, Paris). Centre, tanker loading/unloading bridge equipped with flameproof fittings and projectors (Schanzenbach, Frankfurt). Bottom, lighting of the Chateau du Lude for a 'Son et Lumiere' spectacle (Compagnie des Lampes, Paris).

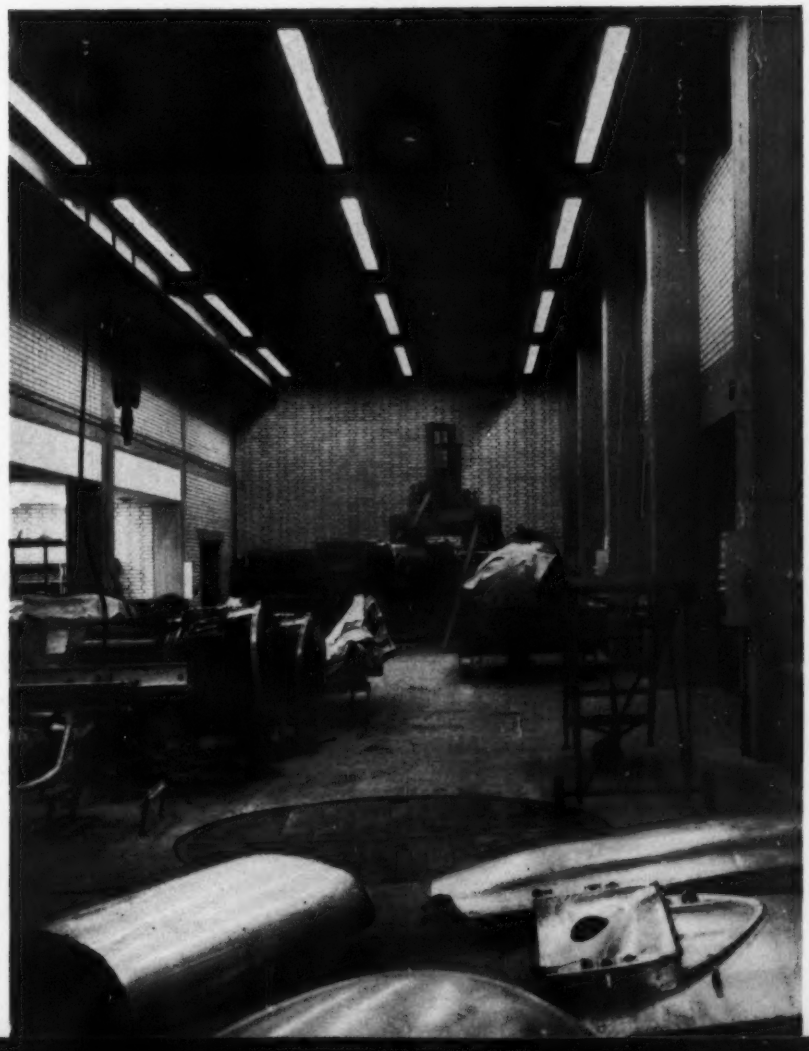
Top of facing page: Left, lighting at a nuclear reactor construction site from 3,000w filament lamp projectors mounted on two 100-ft towers not shown in the picture (Schanzenbach, Frankfurt); right, flameproof lighting equipment on a tank wagon loading/unloading bridge (Schanzenbach, Frankfurt).





LIGHTING IN INDUSTRY

The jet engine repair shop at Frankfurt airport, lit by industrial fluorescent fittings housing two 40w tubes and mounted between the girders above the travelling crane; the average illumination is 35 lm/ft² (Siemens Schuckert, Erlangen).



Electron-valve factory at Sittard, Holland. The general lighting is by means of ceiling-mounted continuous troughs supplemented in some areas by suspended banks of louvered trough reflectors. To obtain the desired illumination of 250 lm/ft^2 on the work benches additional local lighting is provided. 40w reflector fluorescent lamps are used throughout (Philips, Eindhoven).

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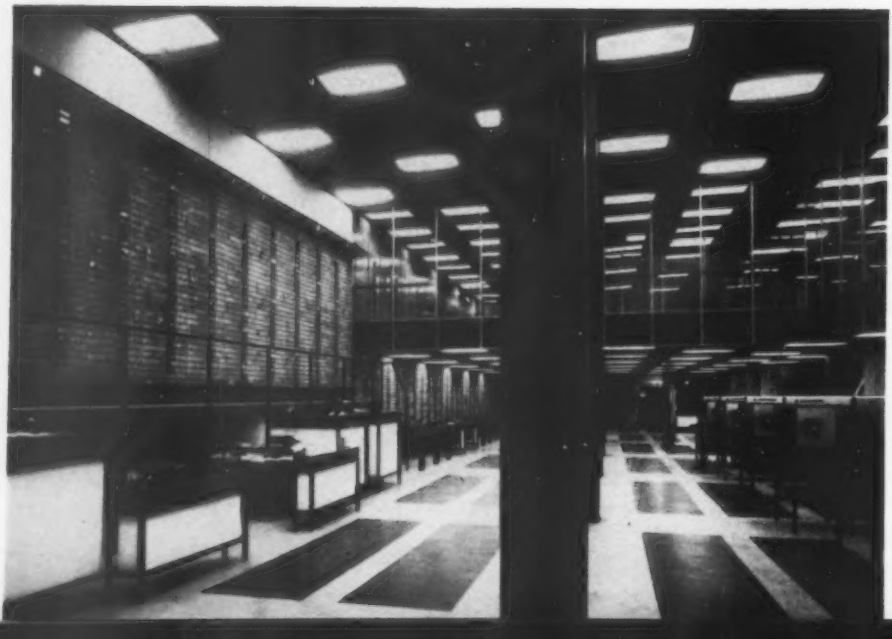
(1) Sleeting looms in an Australian cotton mill, lit by semi-recessed twin 80w fluorescent fittings serviced from above the ceiling; the diffusers are of clear diamond-patterned plastic material with the sides sprayed to reduce brightness (Claude Neon, Sydney). (2) Fluorescent lighting in a Swedish iron ore mine; the walls are painted white to improve visibility. (3) High-bay installation of high-output 8 ft fluorescent lamps in a trailer shop and repair depot near Toronto giving 40 lm/ft² (Wilson, Toronto). (4) High-bay installation of 400w colour-corrected mercury lamps at the Danish Steel Rolling Mills (Philips, Copenhagen).

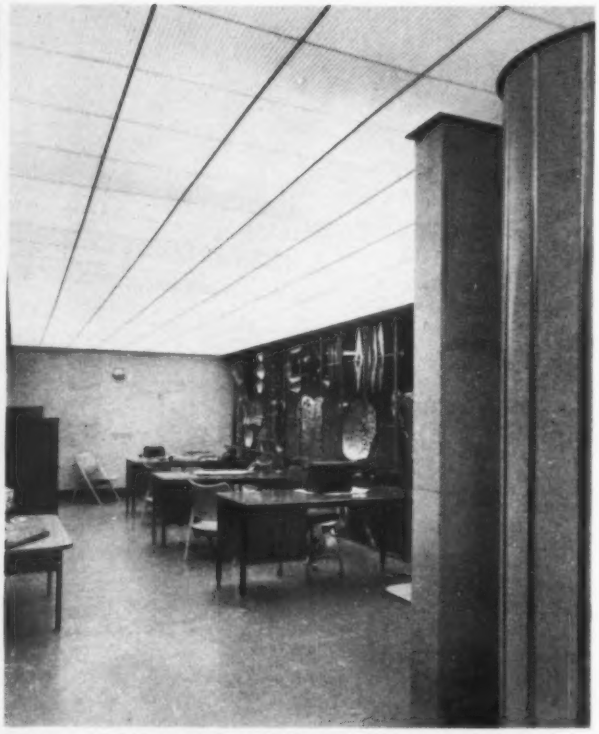
LIGHTING IN INDUSTRY (continued)

OFFICE LIGHTING



Top, decorative louvered fluorescent fittings in the BP Oil Co office at Aarhus (Philips, Copenhagen). Centre, ground floor of Western Assurance Building, Sydney; the smoked glass screen conceals the main telephone switchboard. The system of indirect lighting by inverted troughs was chosen to avoid any distracting pattern of light which might otherwise have spoilt the silhouette effect of a sculpture sited outside and designed to be seen in silhouette against the lighted interior. Below, the main trading floor of the Sydney Stock Exchange; 4 ft by 2 ft recessed fluorescent fittings are used throughout, with three 40w tubes per fitting in single-storey areas increasing up to seven tubes per fitting on the main trading floor, where the average illumination is 60 lm/ft^2

Top, an installation of black-enamelled single-lamp fluorescent fittings in a public office in Germany; the fittings are suspended from the ceiling on white-enamelled tubes and are arranged to follow the layout of the counters and desks (Kaiser, Neheim). Centre, to overcome the problem of reflected glare from glossy materials, 40w single-lamp asymmetric fluorescent fittings with specular aluminium reflectors have been installed in this office in Finland. Below, examples of over-window lighting: left, with inclined fittings incorporating specular reflectors (Zeiss Ikon, Berlin); centre, using polished aluminium ellipsoidal reflectors and vertical louvers; right, with ceiling-mounted fittings (Kaiser, Neheim).



OFFICE LIGHTING
(continued)

(1) The lighting fittings in this lower ground floor lobby at Kindersley House, Sydney, are arranged to encourage visitors up the escalator to the next floor. (2) A luminous ceiling of 'Paragrid-Tiles' at a shipping company office in Sydney; fluorescent lamps are spaced 1 ft apart to give an illumination of 100 lm/ft² on the desks. (3) Another 'Paragrid-Tile' installation, at the National Trust Co offices in Toronto (Wilson, Toronto). (4) The coupon inspection room of the Danish Football Pools; glare from the plastic masks used to check coupons was a great problem but has been overcome by directing light downwards at an angle as can be seen from the light pattern on the back wall of the room (J. Krogh Anderson, Copenhagen).

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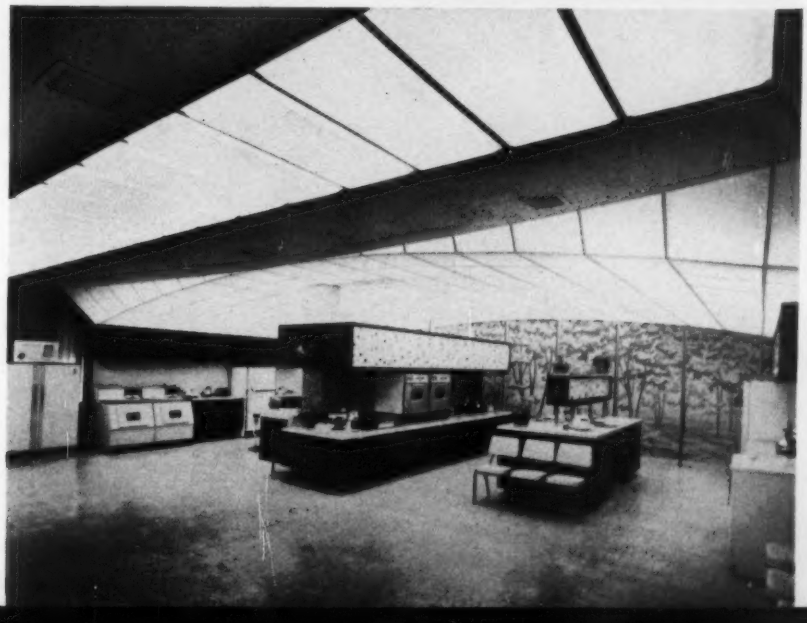
In the Lincoln National Life Assurance Co offices, Fort Wayne, Indiana, 4 ft square recessed louvered troffer fittings are used, fitted with eight 4 ft 40w 'cool-white' lamps; the maintained level of illumination is 80 lm/ft² (Wakefield, Vermilion).

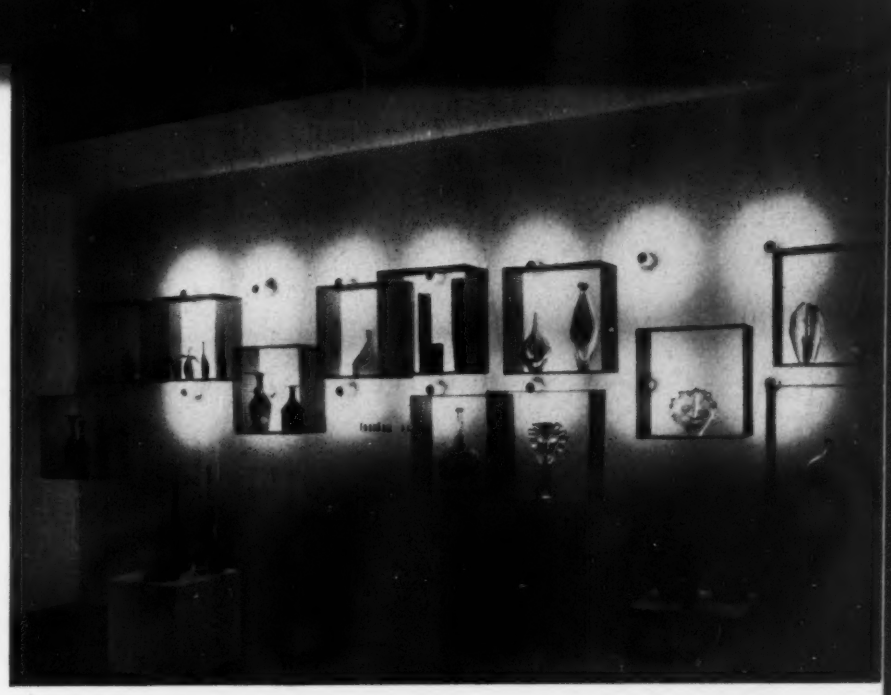
SHOPS AND STORES



Three luminous ceiling installations. Top left, a 'Marlux' ceiling using 40w 'yellow-white de luxe' lamps and giving an illumination of 35 lm/ft² and top right, a similar type of ceiling in a florist's shop in Oslo (International Farvefabrik, Oslo). Below, installation of 'Circlgrid Tiles' in the demonstration area of a public utility at London, Ontario, with air-conditioning vents concealed above; illumination is 100 lm/ft² (Wilson, Toronto).

SHOPS AND STORES (continued)

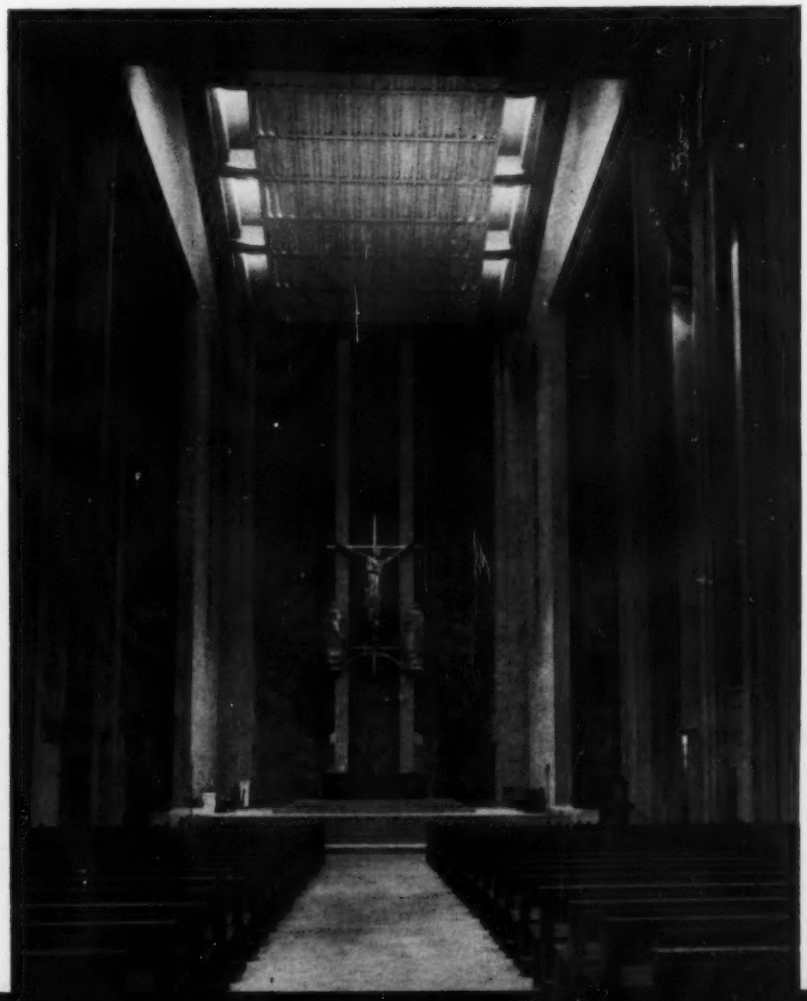
Top, central post office in Frankfurt; the fittings over the parcels counter on the right are each equipped with three 65w reflector fluorescent tubes, the outer two being directed upwards and only the centre one directing light downwards on to the counter (Philips, Hamburg). Above, indirect lighting from the continuous inverted troughs in the entrance arcade to the Auckland Electric Power Board Building (Claude Neon, Sydney). Left, a 'Rotterdam' type ceiling in a tailor's shop in Kiel (Philips, Hamburg).



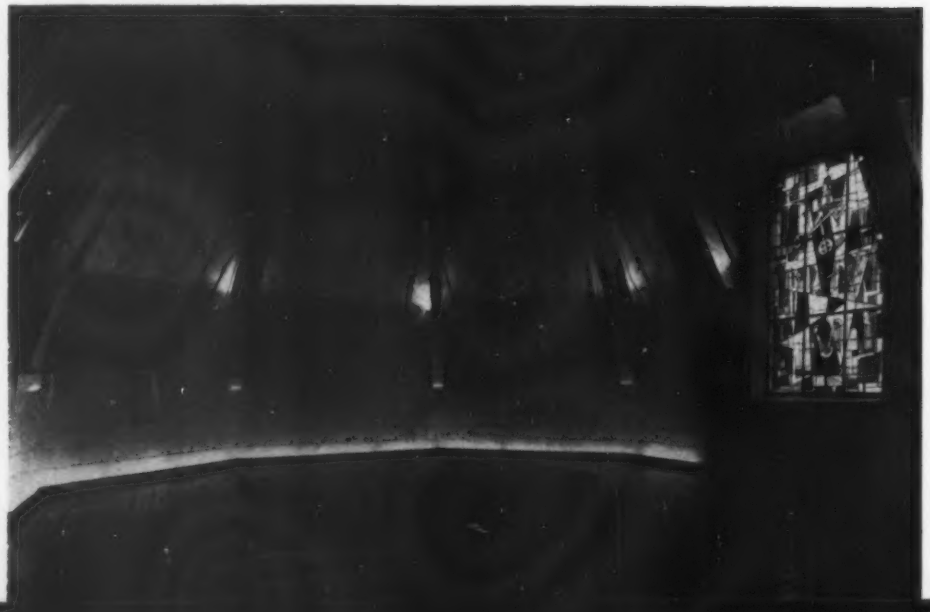
Right, display of glassware seen in silhouette against a wall lit by bowl-silvered lamps (Philips, Eindhoven). Below, exterior shop lighting at Delft using 150w pressed-glass lamps (Philips, Eindhoven).

ECCLESIASTICAL BUILDINGS

Right, the choir of the Church of St Louis at Brest which is lit by eighteen 300w filament reflector lamps (Compagnie des Lampes, Paris). Below, the chapel of Santa Sabina at Strathfield, Australia, lit by fittings of delustred opal glass and satin brass designed by W. Allen Smith.



Top, the main lighting of the Central Synagogue, Sydney, is effected by groups of 100w reflector lamps behind 'Honeylite' aluminium louvers, additional shielding being given by the deep timber louvers in the roof (designer, P. J. Grundfest). Right, St. Paul's Chapel, Sydney University; a picture of the wall bracket is given on page 99. Below, a reconstructed French church in which concealed fluorescent lamps have been used to create silhouette effects (Compagnie des Lampes, Paris).



LIGHTING FOR SPORT

(1) Sports centre at the Technical High School, Delft; 496 40w fluorescent tubes and forty 150w spotlamps proivde an illumination of 40 lm/ft² (Philips, Eindhoven). (2) Bowling alley in New South Wales lit by four continuous runs of 5-ft tubes giving an average illumination over the bowling lanes of 20 lm/ft², increased by local lighting to 80 lm/ft² over the pins (Sydney County Council). (3) Outdoor tennis court at Oslo (Philips, Oslo). (4) Gymnasium lit by fluorescent fittings recessed into the ceiling in conjunction with the air conditioning and ventilating system (Siemens Schuckert, Erlangen). (5) Covered tennis courts at the European Club, Brussels; lighting is from four wide strips of luminous ceiling each of which is flashed by eighty-one twin-lamp industrial fittings giving an illumination of 50 lm/ft² (Philips, Brussels).

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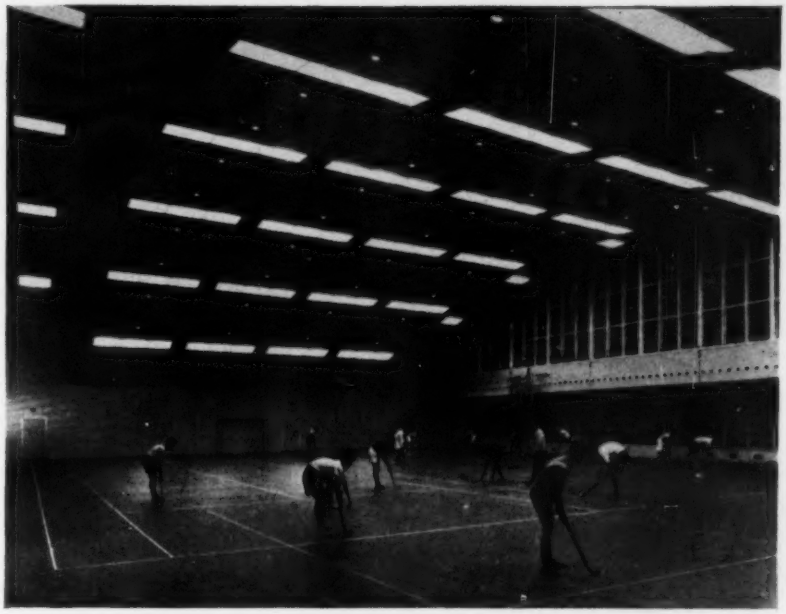
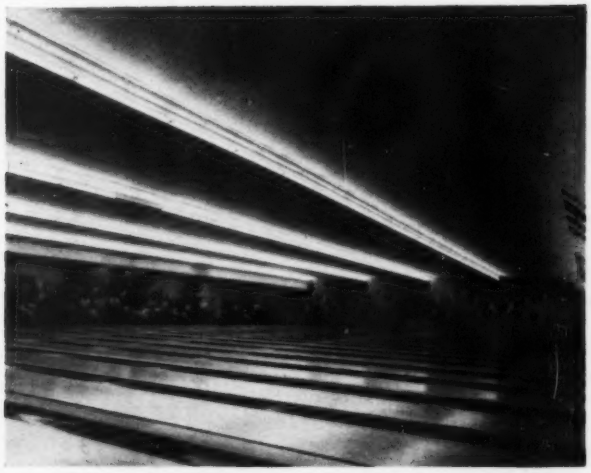
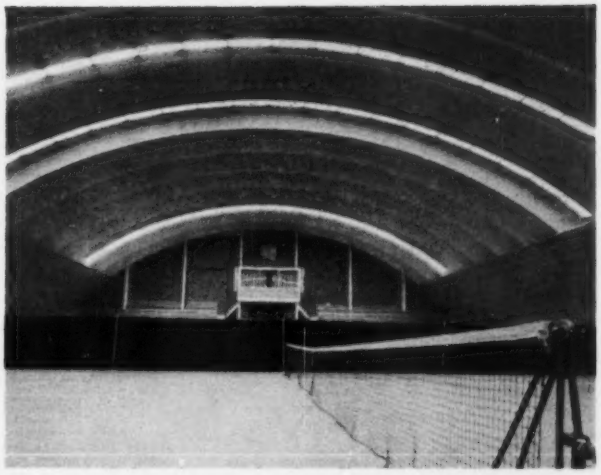
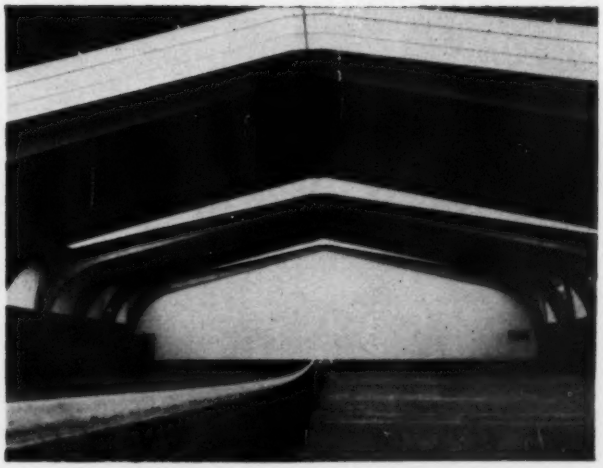
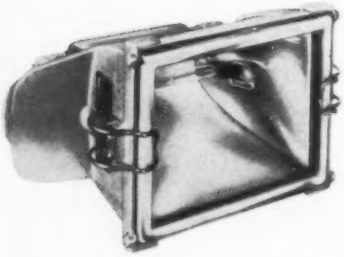


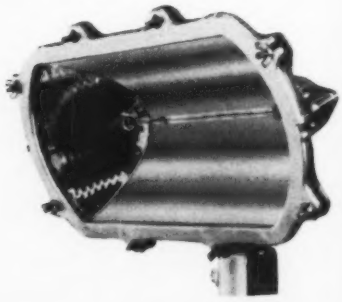


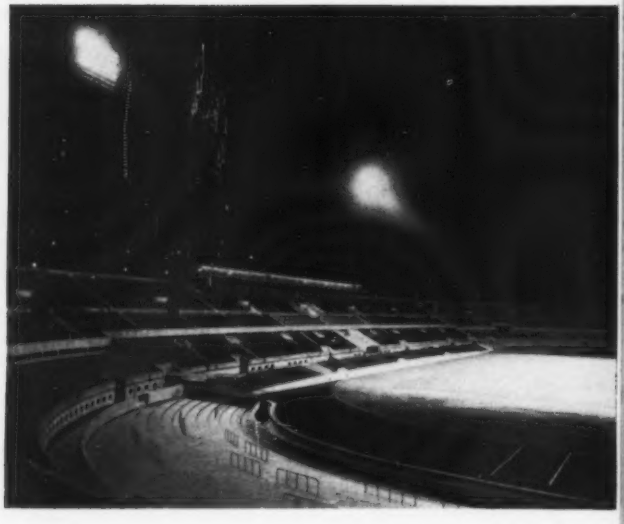




Left, covered tennis courts in Stockholm lit by continuous lines of 80w tubes with polished aluminium reflectors and louvers to a level of 30 lm/ft². Centre, greyhound racing track in the USA lit by projectors (shown immediately below) which utilise iodine-filled, quartz-tube filament lamps. Below left, the Olympic swimming and diving pools in Rome; right, the Olympic stadium which has two systems of lighting, one for football, the other for athletics (Buini and Grandi, Rome).



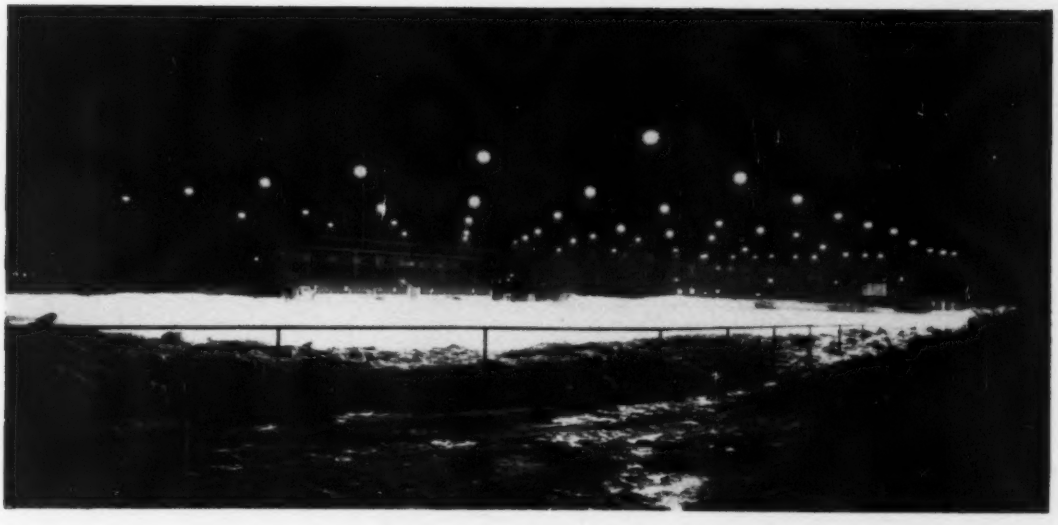




The Flaminio stadium, Rome, designed by Pier Nervi and built for the 1960 Olympic football games. Lighting is from four towers, each carrying sixty 1,500w floodlighting projectors. The grandstand has been made a visual feature by the use of wired-glass laylights in the roof, which give it an interesting appearance under both natural and artificial lighting (CGE, Milan).

LIGHTING FOR SPORT (continued)

Right, one of the four 200-ft lighting towers at the Olympic stadium; each tower supports 240 floodlights of 1,500w each for the football field and 160 floodlights of 500w for the athletics track (Buini and Grandi, Rome). Far right, one of the four 160-ft. towers at the Naples-Fuorigrotta stadium (Ugo Pollice, Milan). Below, sportsground in Sweden lit by deep-bowl fittings with 2,000w filament lamps suspended from wires 35 ft above the ground; the average illumination is 18 lm/ft^2 and more even than would have been achieved using towers.



MISCELLANEOUS

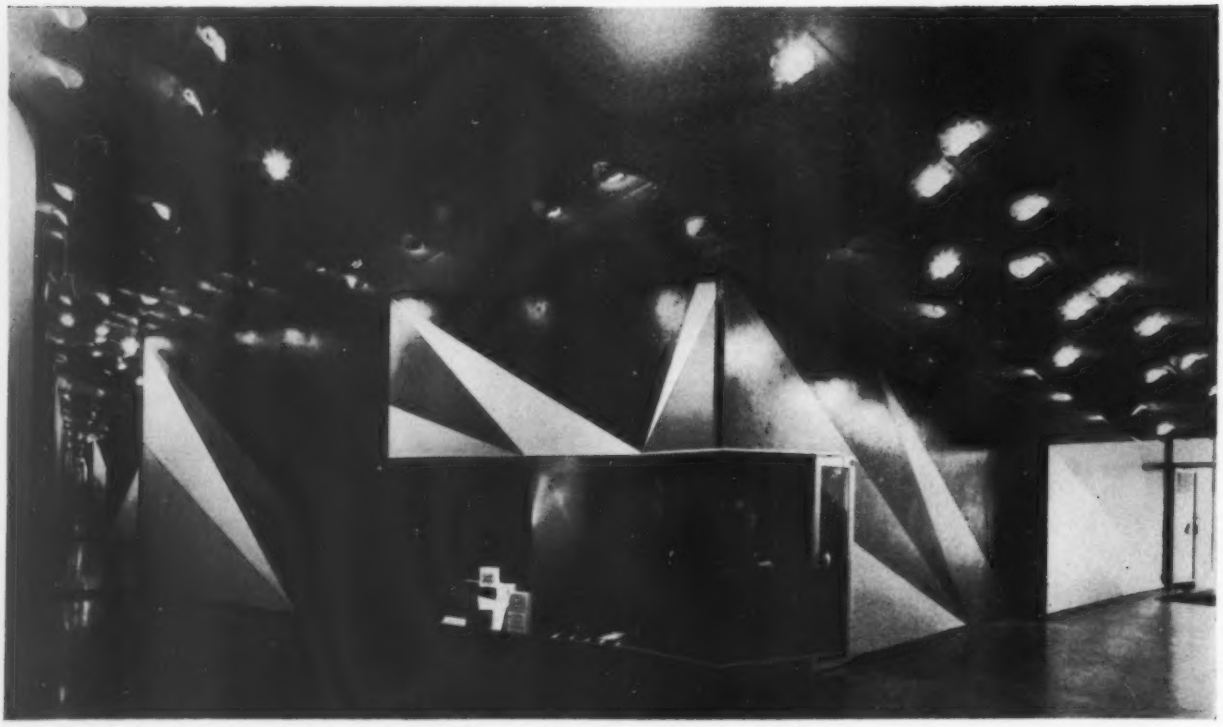
Top, lecture theatre in the new School of Engineering at Canterbury University; it will probably be used as a warning of many things which should not be done in lighting such a place. Centre, the canteen at the Renault service station in Amsterdam (Philips, Eindhoven). Below, the assembly hall of a school in Holland using a variety of lighting methods including pendants, recessed spot-lamps, concealment behind the acoustic ceiling and wall brackets (Philips, Eindhoven).

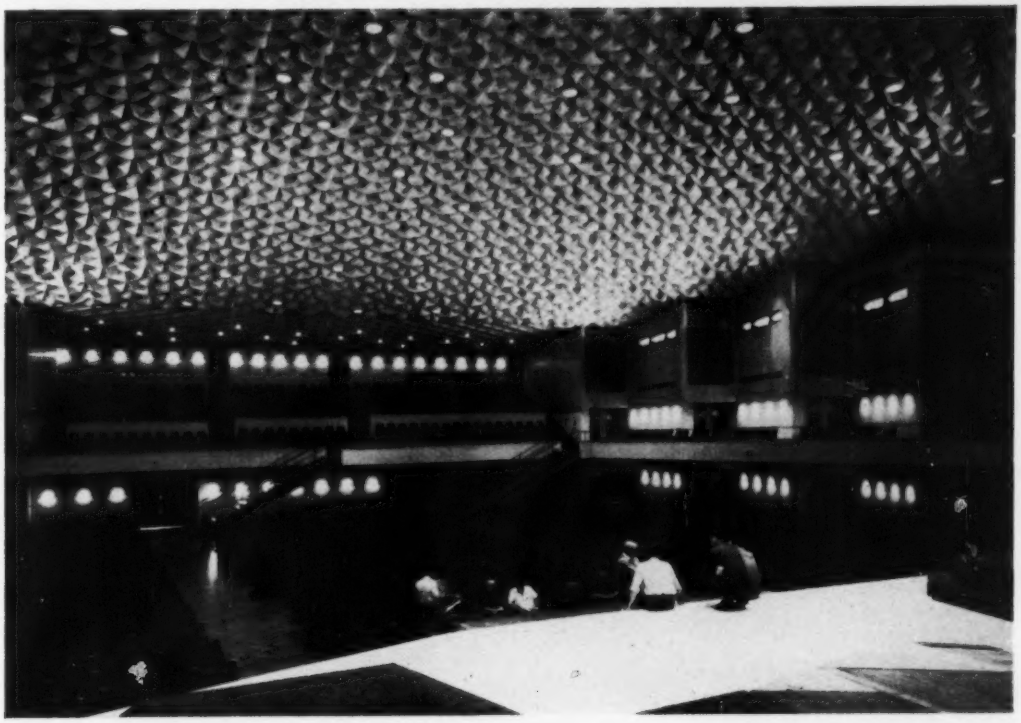
On facing page (1) main drawing office in the School of Engineering at Canterbury University, level of illumination on the drawing boards is 55 lm/ft² (Claude Neon, Sydney); (2) hall of a Japanese style hotel; fluorescent lamps are used in the central recessed feature (which is fitted with paper on glass diffusers) and in the coves at each side (Matsushita, Osaka); (3) the Moderna Museet in Stockholm for which fluorescent lamps with special colour rendering were made; (4) the library of the youth centre in Berlin (Zeiss Ikon, Berlin).

Above, a new hospital bed-head fitting equipped with one 20w fluorescent tube for reading purposes and one 40w tube to give additional lighting for medical inspection; the diffuser is Corning 'Fotalite' glass (Lyfa, Copenhagen). Right, entrance hall of a building in Osaka (Matsushita, Osaka).

MISCELLANEOUS
(continued)

Top left, a corridor in the Philips headquarters in Copenhagen lit by Orrefors crystal glass ceiling and wall fittings. Top right, opal glass fittings with sheet brass 'crowns' in the dining room of the Carlton Hotel, Sydney (W. Allen Smith). Below, the entrance hall of a new multi-storey building in Stockholm; the walls are painted in different colours and lit by spotlights in the ceiling, the aim being to give an impression of the new world of technology in which we now live.





Above, the main lighting of the Beethoven Hall in Berlin is from 82 fittings housing 1,000w filament lamps and recessed into the special acoustic ceiling which is itself lit by 122 reflector fittings recessed into the upper part of the wall. Below right, the state theatre at Gelsenkirchen; the semi-circular wall of the foyer is decorated with sponge-like plastic (see left) and is floodlit from both the ceiling and floor by means of parabolic reflector units housing 12v 75w lamps.

MISCELLANEOUS (continued)

MISCELLANEOUS (continued)

Top left, the concourse at the new School of Engineering, Canterbury University, is lit by cold-cathode pelmet tubes on the door side and by wall brackets (with 200w upwards and 100w downwards) on the other side (Claude Neon, Sydney); top right, entrance canopy and main foyer of the Wanganni Memorial Hall showing the striking effect obtained by lighting the square troughs formed during construction by 75w filament lamps screened by a small metal spinning (British GEC, Wellington). Below left, a night-time view of the Pirelli building in Milan (Osram, Milan); below right, a combined sculpture and lighting fitting designed by Arne Jones and used to light a small square at Skonsberg in Sweden.

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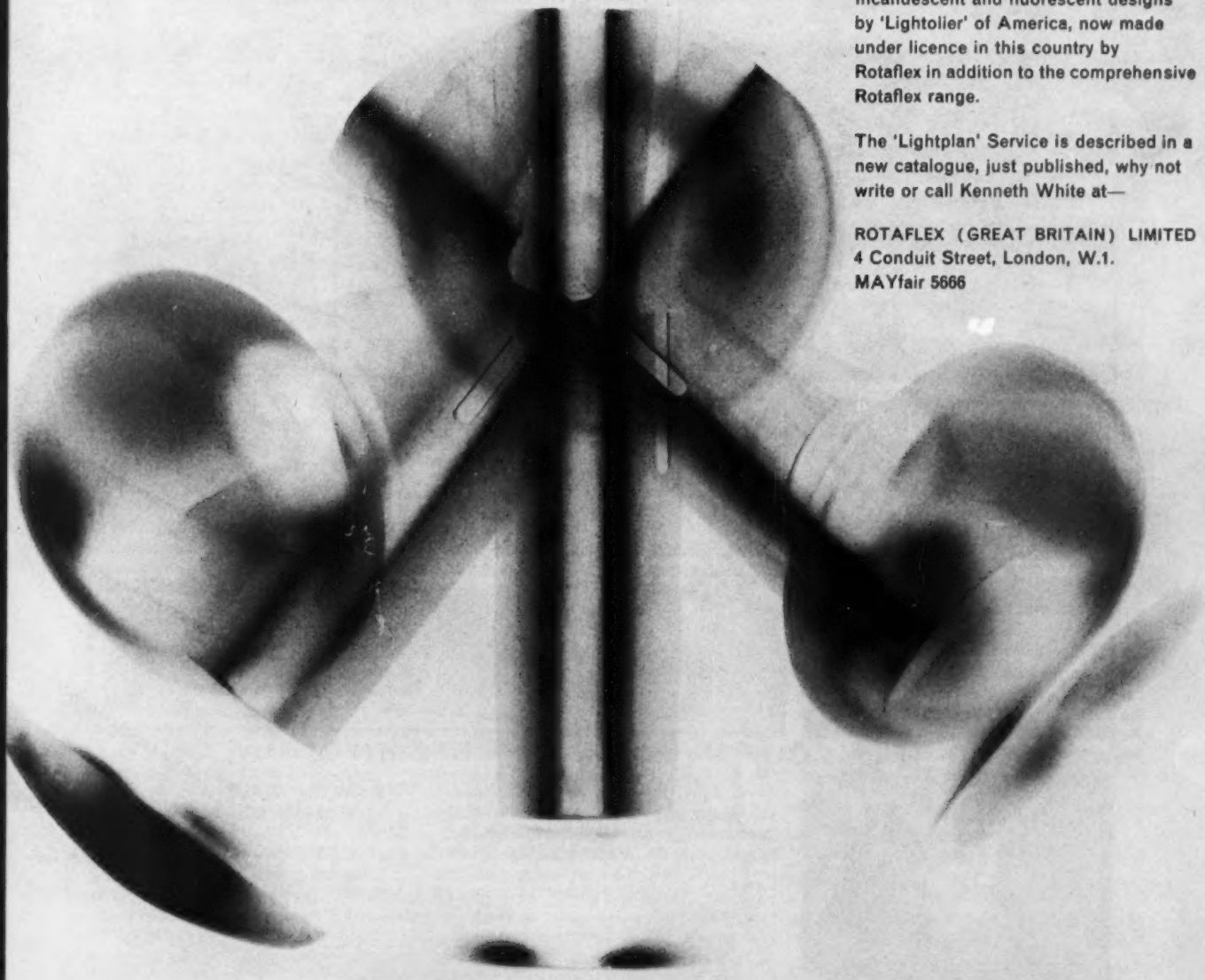

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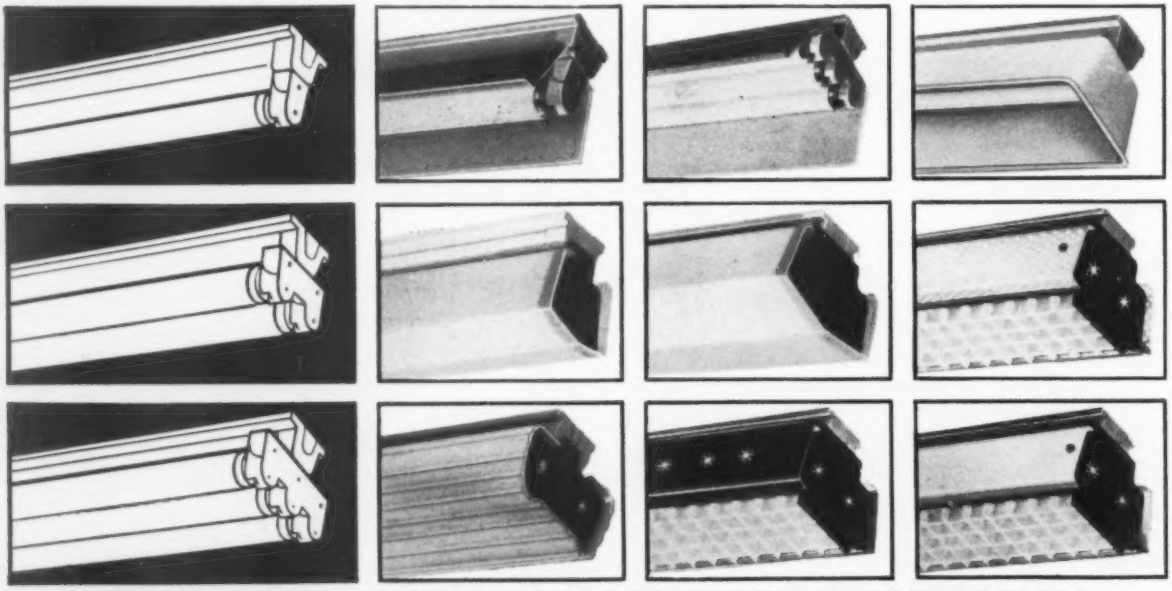

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(LD3284)

International Co-operation on Lighting Standardisation

BY A. G. PENNY

IT MIGHT BE SAID that exporters have the choice of either competing with the local manufacturer by offering a similar product or seeking to cater for a neglected demand by offering something which is different from any locally produced article. Typical examples familiar to anyone in the British lighting industry are Dutch-made mercury lamps and Czechoslovakian crystal chandeliers. It is not proposed to deal in this article with the problems of marketing products in the latter category as that is a situation in which international co-operation is noticeably, and probably desirably, absent.

In the first case the exporter has, by definition, to offer a product which is not only similar, but is also interchangeable and conforms to any local standards, safety regulations and the like; he has to pay import duties and overcome the variety of devices, technical, commercial and political which the domestic industry creates to prevent competition from overseas. Fair competition is, of course, never objected to for fear of retaliation when the local manufacturer, in his turn, becomes an exporter—though the word 'fair' is capable of many interpretations.

It is common knowledge that few exporters know where the next order is coming from. World conditions change so rapidly that the manufacturer who has for years enjoyed a steady trade with say, Australian consumers, may wake up one morning to read in the daily papers that all imports into that country are banned indefinitely. If this happens, to keep his factories going, the product destined for Australia must be switched to some other territory. But if the product for Australia is not acceptable elsewhere, expensive retooling in the factory is necessary before his salesmen can seek other markets and if each of these has its own local requirements the lot of the exporter is indeed unhappy.

In some industries this unsatisfactory state of affairs is so common that international trade can hardly be carried on at all. This state of affairs, if widespread, could be catastrophic for countries such as the United Kingdom which, as has been said so often, must export to live.

International Electrotechnical Commission (IEC)

It is fortunate that in the early days of the electrical industry this fact was clearly realised by the two countries, Britain and Germany, which were the leaders of the electrical industry. Technical interchangeability and common standards of safety were seen to be necessary and the international Electrotechnical Commission was founded (largely at the inspiration of Colonel Crompton) in 1904 to act as the organisation through which participating countries could formulate internationally agreed recommendations and press their acceptance by all nations. Since that date it has grown steadily in stature and today over thirty countries are members, all pledged to endeavour to bring their own national standards into conformity with IEC recommendations. This is often a surprisingly difficult undertaking to effect, as will be seen in a later paragraph.

Since 1947 the IEC has been affiliated with the International Organisation for Standardisation (ISO) as its electrical division but retains technical and financial independence. It works through a committee structure, each type of electrical apparatus for which a standard (or standards) is considered desirable having its own technical committee. The secretariat work of the committee is shared out between the member countries, leaving the IEC's own secretariat in Geneva to concentrate on the running of the Commission itself. The direction of the Commission is by means of a Council upon which all national committees are represented; but as the Council normally meets only once every three years, many of the functions of the Council are delegated to a Committee of Action upon which member-countries are represented in rotation, nine member-countries at a time. The documents prepared by these bodies are *recommendations* upon which the various countries can base their national specifications.

The general procedure for preparing a new recommendation or the revision of an existing one is similar in each case. A proposal will reach the appropriate technical committee, or it may be made by the committee itself. A draft will be prepared by the committee secretariat, sometimes assisted by a panel of experts who at this stage have no national responsibilities. The technical committee will be comprised of delegates from all interested member-countries who carefully consider the draft and if necessary modify it in the light of the arguments put forward by the delegates until they reach agreement upon what may be regarded as a consensus in national opinions. In most cases the time taken to reach this stage is likely to be anything up to three years. When an agreed draft has been prepared it is circulated by the central office to all the national committees who are asked to consider it and confirm their acceptance or rejection, together with any comments they wish to make, within six months. If 80 per cent of the member-countries accept (abstainers are assumed to be acceptors) and no comments of a technical nature are made, the document goes forward for publication subject to any editorial alterations which the chairman may think desirable. If 80 per cent of the member-countries accept but technical comments are submitted, the chairman may propose modifications which are circulated to the national committees who are expected to return their votes within two months. If less than 80 per cent of the member-countries accept, or if comments of a fundamental nature are submitted by several national committees, the chairman may decide to refer the draft back to the technical committee for reconsideration.

All matters relating to lighting are handled by Technical Committee No. 34, which, because of the wide variety of subjects to be dealt with, has set up the following sub-committees:

S.34A Lamps
S.34B Lamp caps and holders
S.34C Auxiliaries for fluorescent lighting
S.34D Luminaires

Some of the IEC publications which have already been dealt with in the above manner are:

No 61 International recommendations regarding lamp caps and holders

together with gauges for the control of interchangeability.

No. 64 International specification for tungsten filament lamps for general lighting service.

No. 81 International specification for tubular fluorescent lamps for general lighting service.

No. 82 Recommendations for ballasts for fluorescent lamps.

International Organisation for Standardisation (ISO)

The objects of the ISO are very similar to those of the IEC, but its scope is wider inasmuch as it is interested in standardisation in every field (except electrical). As with the IEC, members of the ISO are the national standardising bodies in the countries that have agreed to abide by the constitution and procedure. The progressing of agreed recommendations is similar to that with the IEC.

The following examples illustrate the diversity of the subjects covered by the ISO: basic materials such as coal, steel, rubber, plastics, paper and textiles; recommendations for the terminology for cement, concrete and refractories; recommendations concerning dimensions of screw threads, and joints for laboratory glassware. The ISO is actively engaged in the preparation of standards covering material and apparatus used in aircraft, including electric lamps. International standardisation of aircraft lamps has long been overdue and will be particularly welcome to airline operators who in the past have had to make arrangements for an extensive stock of a bewildering number of types in various parts of the world if they wished to avoid the annoyance arising from non-interchangeability. The ISO is also working with the CIE for the purpose of specifying the optics for motor car lighting.

Altogether there are some 100 ISO technical committees of which the British Standards Institution acts as secretariat to twenty-three.

International Commission on Electrical Equipment (CEE)

The International Commission on Rules for the Approval of Electrical Equipment (CEE) is a European organisation whose declared aim is to protect the public against the risks of electric shock arising from the use of poor electrical equipment. It operates in a manner similar to the IEC and ISO through a committee structure with each member nation having its own national committee. In this case the British national committee is nominally a joint BSI—British Electrical Development Association affair, but the actual technical work is done through the BSI.

The Committees which are important to the lighting engineer are: General requirements, Lamp holders, Lighting fittings, Fluorescent lamp auxiliaries.

The main publications are:—

CEE 2 Rubber insulated cables and flexible cords.

CEE 3 Edison screw lamp holders for incandescent lamps.

CEE 12 Fluorescent lamp auxiliaries.

CEE 13 PVC insulated cables and flexible cords.

Specifications of electrical apparatus are built up by creating general requirements and adding to them the appropriate requirements for the various classes of apparatus.

The present activities of Lighting Fittings Committee provide an illustration of how these latter special requirements are dealt with. This committee is preparing a specification for tungsten lamp fittings which will include temperature limits. The intention of this is to remove the danger of fire caused by allowing the fitting to become too hot, or short circuits in the adjacent wiring due to over heating of the insulation.

An obvious solution is simply to limit the power of the lamp to be used in the fitting so that no component of the fitting will operate above the safe temperature limit, as defined in other CEE specifications. But when an attempt is made to carry out tests in accord with this principle all sorts of difficulties arise. If a manufacturer says his fitting is designed for a 100 w lamp how does a testing authority check this? By buying an ordinary lamp over a retail counter? There are many designs of 100 w lamp and although they may be made to the same national or international standard there is nothing in any such standard regarding heat output, distribution of heat energy, constancy of energy dissipation, surface temperature etc. So, if fittings are to be tested for temperature, there must be a standard source of heat and standard conditions of test.

The most convenient way of achieving this seems to be to provide a heat test source in the form of a special lamp, so the CEE asked the IEC lamp committee to design one, because to ensure equal test conditions in all countries it is necessary to have an international agreement on the characteristics of the heat test source. Such a heat test source has now been designed and samples are being tested for constancy and reproductability. Other samples are in the hands of testing authorities to see how they enable the suitability of a fitting to be checked.

If such a heat source is adopted one very important consequence arises. Production lamps in every country would have to be designed so that they never cause a fitting to operate at a higher temperature than that caused by the standard test source. This is a limitation on future design which lamp makers have never before accepted and would have a profound effect upon the direction of lamp makers' research efforts. The leading European lamp makers —including the British—have agreed to accept this limitation and in due course an appropriate clause may be expected in all national and international lamp standards.

International Commission on Illumination

The Commission Internationale de l'Eclairage (CIE) was first formed in 1913 by the re-organisation of the existing Commission Internationale de Photometrie which was created at the International Gas Congress held during the Paris Exhibition in 1900. It is neither a government nor a commercial organisation, and cannot, moreover, be regarded as a standardising body. Members are technical experts who meet to consider special aspects of lighting: vision, light sources, industrial and street lighting, automobile lighting, daylight, etc.

Perhaps the CIE can best be regarded as an international lighting society which brings together lighting experts from all over the world and thus presents them with an opportunity of discussing the latest developments in lighting. The activities of the CIE in this direction are so well known to readers of *Light and Lighting* that there is no need to describe them here. The place of the CIE in relation to such bodies as the CEE, IEC and ISO is not so well understood and the illustrations given below may help to make this clearer.

Collaboration

From time to time the CIE appoints committees of experts to prepare reports of progress on particular subjects which will eventually be circulated to national committees. The recommendations which are made are based upon international discussions and they are frequently adopted by standardising organisations throughout the world. Many years ago the CIE defined the 'standard Photometric observer', and although this has been much criticised throughout the years it has remained practically unchanged to date, although it is now under revision. The CIE has also made many other recommendations, in particular concerning the colours used for signal lights which have been adopted for railways, aircraft and ships. In another field, as has already been mentioned, the CIE is collaborating with the ISO to secure the greatest possible measure of agreement for the light distribution in the beams of automobile headlights. Another important matter which the CIE has undertaken to investigate is the problems associated with the photometric and colourimetric measurements of discharge lamps for the purpose of unification of national lamp specifications.

So far little has been said about the speed at which collaboration between the various bodies produces results. Sometimes spectacular results are achieved but all too often the reverse is the case. Perhaps the saddest case of all is that of the colour

rendering properties of lamps. When discharge lamps became a commercial proposition in the early 'thirties the problem of defining the colour rendering properties of light suddenly became of urgent practical importance because of the varieties of lamp which electric discharges and luminescent powders made possible. This is the work which is properly the function of the CIE. A method of assessing it by measuring the energy or special luminance in a number of bands was proposed before the Second World War and provisionally adopted in 1948. From the start this method has been strongly criticised in many quarters and at almost every CIE meeting since it has been agreed that the establishment of a comprehensive method of assessing colour rendition was urgently necessary. Without it the IEC could not include the specification of colour rendering requirements in its recommendations for fluorescent lamps. But no alternative has yet been agreed by the CIE, and the IEC have been forced to make use of what is commonly regarded as an inadequate method of measurement; twenty years have not produced an answer.

On an even more practical matter it may be recalled that the requirements for the beam pattern of car headlamps was being studied by the CIE in the 1930's, in the expectation that the ISA (the forerunner of the ISO) would, in due course, be able to promulgate international standards. Provisional ISO standards are only now coming into use. It must in all fairness be recorded that such delays are in some measure the result of the Second World War but they do at least serve to make clear how much the work of one organisation waits upon the investigations of another.

The method by which IEC and CEE standards come into existence has been described and some indication given of the time taken. Two or three years may be regarded as not unreasonable for international agreement, but when it is borne in mind that amendments or improvements in an existing standard are also subject to the same delay there is surely reason to examine the system, at least in regard to such an active industry as lighting. We may perhaps compare British Standard 161 for incandescent lamps with IEC Publication No. 64 which also deals with the same subject. The last major revision to BS 161 was in 1956. Since then ten amendments have been published. Publication No. 64 first appeared in 1950; the third edition is expected to be available late in 1961.

The consequence of such delays is that it becomes increasingly difficult to keep national and international standards in step. Either national standards are held back—as happens in some countries—or there are divergencies which cause friction and misunderstanding. Some system of more speedy action on an international scale is urgently necessary even if it costs money.

In matters of safety there is not, of course, so much likelihood of standards needing revision. In theory, at least, a standard of safety is an absolute matter not subject to change with the introduction of new apparatus. Nevertheless, new developments bring with them new safety problems. For instance, a breakdown of insulation in a tungsten lamp fitting may result in the metal becoming live. But if the apparatus is properly earthed a short-circuit to earth will occur, a heavy current will flow and the circuit fuse will operate to remove the danger. But in a discharge lamp fitting the fault may lie between the lamp and the choke so that the current is controlled and the fuse will not operate even though the fitting becomes live. Thus new problems arise and have to be considered by the CEE and the IEC.

In work such as this it is often comparatively easy to find a technically satisfactory solution, less so to find one that does not involve greatly increasing cost or reducing ease of use. Membership of the experts' committees of all these bodies must, therefore, be a fusion of interests and knowledge. Men of practical experience of how, why and where accidents occur must meet with men who know how, why and what can be made, what users want and what users will do. Such people must be joined with men of experience in testing techniques. All need to keep up to date with the latest techniques in design, manufacture, testing and usage. There is in fact a special expertise necessary for the preparation of a standard which comes only from experience in writing specifications. Like everyone else, standardisers learn the hard way.

Finally, whether it be an IEC Standard or a CIE Recommendation of Desirable Practice there is the fundamental necessity that it should be written clearly, concisely and unambiguously in all the internationally used languages. English, French and Russian are the official ISO and IEC languages; English, French and German, those of the CIE; English and French for the CEE. The tasks and responsibilities of the secretariats of all organisations and their national counterparts are heavy indeed. They have the duty of making sure that the experts can be understood.

Towards Better Offices

PROTAGONISTS FOR better working conditions in offices now have a massive supporter in the Institute of Directors, which last month published the results of a comprehensive study of the subject in a book 'Better Offices' (obtainable from the Institute, 10 Belgrave Square SW1, price 12*s*. including postage). From the lighting engineer's viewpoint, the book is particularly to be welcomed for a commendable chapter on lighting, which puts the case for good lighting in an admirably clear, succinct way, in terms office users and designers will readily comprehend.

The chapter starts by discussing illumination levels, and makes the useful point that any legislative minimum standard which may be laid down is likely to remain appreciably below optimum standards justified economically for the efficient and comfortable performance of different types of work. In this respect, the book cites relevant figures from the new IES Lighting Code. There is also a useful section on glare, which points out that the greater effectiveness resulting from a lighting system designed to limit glare to acceptable levels will compensate for any additional capital cost involved.

Daylighting is dealt with from aspects of of both site development, window design and glazing and includes reference to the permanent supplementary artificial lighting of interiors, and to those situations where it may be required. This development is generally welcomed and a due note of caution is sounded in pointing out that the design of p.s.a.l. requires skill. It suggests, however, that the system may not be wholly suitable for this country, in view of the tendency to partition-off spaces for supervisory staff, which may in turn affect satisfactory operation.

Artificial lighting, which is also referred to with fine distinction as electric lighting, includes a lengthy contrast and comparison of filament and fluorescent lamps with the balance of favour coming down firmly for the latter. There is also some useful discussion on general matters of design.

What many will find particularly welcome however, is the inclusion of a section on colour schemes, thus bringing home the essential interdependence of lighting and colour. Two common attitudes—the general use of dark surfaces to conceal dirt on the one hand and the free application of intense colours according to personal whim on the other—are rigorously condemned.

It will be appreciated that in this book, lighting is but one of many aspects of offices which are dealt with and that its treatment is necessarily general in character. More recently, the IES have published their new Lighting Code, which, whilst intended primarily for designers, has much to offer for the guidance of users, particularly if they wish to study in greater detail the problems of, and good practice in, natural and artificial lighting design, control of glare and permanent supplementary artificial lighting.

IES Activities

CLOSE ON ONE HUNDRED members turned up at the London Sessional meeting in March to hear Dr Einhorn boldly present his two papers, dealing with lighting calculations and the predetermination of direct discomfort glare. Both papers were aimed at 'the practical man' in that they presented simplified formulae suitable for rapid calculation with the aid of a slide rule.

On calculations, Dr Einhorn argued that the lumen method had the basic defect that it gave average illumination levels whereas the more preferable aim would be to determine minimum illumination levels. To achieve this latter end, the designer requires point-by-point methods, which Dr Einhorn presented for point sources, and line sources. The latter calculations were based on the sector flux concept whilst the former were based on a simplified application of the inverse square law. Discussion on the paper was comparatively brief, and was mainly directed at arguing that Dr Einhorn, having gone thus far in simplification, might perhaps have gone a little farther.

His paper on glare was devoted largely to justifying a simplification of the BRS formula, $GS = B_s^{1.6} \cdot \omega^{0.8} \cdot B_b^{-1}$. There was no quarrel with the basis of the formula that glare was directly related to the source luminance, the solid angle subtended by the source at the eye, to the inverse of the background luminance and to functions of the angle of displacement of the source from the line of sight and of the immediate surround luminance. It was argued, however, that glare is additive—that two sources each of a given area are as glaring as a single source of twice that area—and this condition requires a glare factor in which the exponent of area or solid angle is unity. On this basis, it was possible to make the further simplification of replacing the solid angle term by source area and a location coefficient to give greater convenience in design work.

That Dr Einhorn was appearing to cast doubts on the BRS formula and, by implication, on the work based on that formula which would be appearing in the new IES Code, was soon apparent from the discussion, in which information was sought on experimental basis for his formula, and on how the immediate surround luminace was to be derived. Since all present glare formulae are empirical, it was granted that Dr Einhorn was at liberty to put forward his own but any relationship had to stand or fall by its validity in field tests. The BRS formula had the advantage of being independent of spacing/height ratio and thus lent itself to a simplification by which the means for ready glare control could be put into the hands of every lighting engineer.

In the Centres

ABOUT A HUNDRED members and visitors including representatives of the County Police and the AA heard Mr H. R. Ruff and Mr K. J. Jones open a discussion on 'Future lighting for night travel on the roads' at the January meeting of Leicester Centre. Mr Ruff reviewed the progress made in recent years in 'static' road lighting and described and illustrated some of the latest developments in light sources and the ways in which they could be used to the best advantage to reduce road accidents at night. Putting a technical, road safety and economic case for end-to-end lighting of motorways, Mr Ruff expressed the view that 'future generations would be astounded that we travel down motorways using only headlamps'. Mr Jones stressed the two main purposes of headlamps: to enable the driver to see and to provide light by which the vehicle is seen by other road users. Slides of new headlamp designs, including the sealed-beam lamp, were shown. Of the recent trends, the multi-headlamp car with various combinations of 'main' and 'dipped' beams is likely to become popular Mr Jones pointed out that car manufacturers should ensure that signals had all round visibility; too many at present had a blind-spot. He was also of the opinion that headlamps should be on at all times after dark, the 'dipped' beam being used even when the street-lighting is good. In the discussion which followed, safety at night, standardisation of red and amber signal colours, driving in fog and the desirability of a code for headlamp-flashing signals were some of the many points raised by members of the audience.

AT LEICESTER'S FEBRUARY meeting, Mr A. W. Marsden gave a talk on 'Basis of Illumination levels in Britain and the USA', which as he explained was an attempt to discover on what grounds a designer decides on the quantity of light required. The work of Weston in Britain and that of Blackwell in the USA were discussed. Blackwell's complex approach to the problem was compared with Weston's simpler method and although the speaker thought that Weston's system was right for the British Code he was of the opinion that the basis of Blackwell's experiments, in spite of their present limitations, could lead to a satisfactory specification. Blackwell's researches are far from complete and results were given much too early in his experiments. The experimental field has been confined almost entirely to black and white; the colour contrast field about which there is a lack of information has yet to be thoroughly explored.

A 'LIGHTWEIGHT' CONTEST, billed by Birmingham Centre on February 27, brought Mr J. G. Holmes and Dr W. E. Harper together to extol the respective merits of glass and plastics. Mr Holmes based his case on the partnership between light and glass and proclaimed the essential value of glass to enclose, to protect, and to control light. Glass was of paramount importance to the electric lamp industry. It was unrivalled in enclosing the source of light. He acknowledged the value of plastics, where applicable. Dr Harper judged plastics materials for the lighting industry in terms of their translucence, reaction to heat, and strength. He dealt with some of the established plastics used in the manufacture of lighting fittings and introduced some of the newer materials which may be developed for the same purpose. He believed plastics led in the current development of self-supporting lighting fixtures, but concurred that plastics and glass were complimentary to one another, and that each played its own valuable part in the lighting industry.

Forthcoming Events

LONDON

April 11
Presentation of Certificate of Honorary Fellowship to HRH The Duke of Edinburgh; The new IES Lighting Code, by Dr W. E. Harper. Institution of Electrical Engineers, Savoy Place, WC2, 5 p.m. (admission by ticket only).

April 12
Annual Dinner and Dance. Criterion Restaurant, Piccadilly Circus, W1.

CENTRES

April 5
NEWCASTLE-UPON-TYNE. The design criteria for integrated lighting in buildings, by D. R. H. Phillips. Room B7, Percy Building, King's College, Queen Victoria Road, 6.15 p.m.

April 6
NOTTINGHAM. Ship lighting, by A. E. Fothergill. Electricity Centre, Carrington Street, 6 p.m.

April 13
MANCHESTER. AGM; Symposium: W. Carlton, G. Mawson, J. E. Tonge. NW Electricity Board, Town Hall Extension, 6 p.m.

April 17
LEEDS. The artistic use of lighting in multi-camera technique, by H. E. H. Mayhew. BLC, 24 Aire Street, 6.15 p.m.

April 24
BIRMINGHAM. Colliery electrification, by G. W. Hall. At Rugeley, combined with visit to surface installations at Lea Hall colliery.

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MISCELLANY

Overseas News

THE FIRST NATIONAL MEETING of Italy's Illuminating Engineering Society (Associazone Italiana di Illuminazione), to be held in Turin, May 11–13, has a full programme for delegates. The interest is primarily in street lighting, on which subject there are no less than 11 papers out of a total of 16, whilst two of the remainder are also concerned with public exterior lighting. There is a major contribution from outside Italy, with authors from Belgium, France, Germany, Holland and Britain. The British speakers are J. M. Waldram (re-presenting his now classic paper, 'Visual problems on motorways') and G. F. Cole, who is to enlarge on the new IES Lighting Code. Further details can be obtained from AIDI at Via Donizetti 30, Milan.

READERS OF *Illuminating Engineering* will already have noted the series of three articles on domestic lighting, under the title 'Lighting—Keyed to today's homes'. The complete article has now been published separately by the American IES as a booklet which will repay study by anyone concerned with the appearance of the domestic scene. It contains a wealth of ideas on the lighting of both interiors and exteriors emphasising that good lighting effects (whether decorative or functional, or a combination of both) can be achieved from quite simple components. It may be obtained from the Society at 1860 Broadway, New York 23, New York, price $1.50.

IMPRESSIVE STRIDES are being made in the USA in the commercial development of electro-luminescent light sources, the latest being an all-out drive by Westinghouse to apply them in architectural and interior design. They are now offering their 'Rayescent' panels in sizes large enough for their use as, or in, walls, ceilings, room partitions, table tops, shelving and furniture generally. The Tower restaurant in New York's new Time and Life building now has tables whose tops are entirely electroluminescent; the tables are either 51 in. or 42 in. in diameter and each top is made from four 'Rayescent' panels covered by a protective plastics sheet. An hotel in Houston, Texas, now being reconstructed, is to have an electroluminescent foyer ceiling.

THE PROBLEM of heat emission from light sources for projection has been neatly solved by Sylvania in a new range of cinematograph projector lamps. These are reflector lamps, using a 'sagged' glass reflector with a dichroic coating. The sagging process accurately curves the bowl of the reflector and ensures a smooth uniform reflecting surface. The dichroic coating, developed in conjunction with Bausch and Lomb, consists of multiple layers of a special substance, each layer being 6×10^{-6} in. thick. This coating reflects only the visible energy emitted from the filament, allowing the infra-red component to pass through.

THE PHILIPS ORGANISATION, as represented by N. V. Philips Gloeilampenfabrieken at Eindhoven and the United States Philips Trust, effected sales amounting to 4762 million guilders in the financial year 1960, as against 4182 million guilders in 1959. The trading profit amounted to 862 million guilders, 122 million guilders more than in 1959, and the net profit 397 million, of which 217 million will be retained in the business. The dividend of 16 per cent remains unchanged.

Industrial Notes

IN VIEW OF the success of the tour in northern Italy organised last year by the Council of Industrial Design for directors, design executives and designers, the Council is planning a similar kind of tour this year in Scandinavia. The tour would be for two weeks with travel by air from London to Copenhagen, on to Stockholm and Helsinki, and return via Oslo to London. Visits have been arranged to the countries' centres for design and craftsmanship, to various department stores noted for the quality of their products, to studios and to factories, including the Orrefors glass works. Opportunities will be provided to meet industrialists, architects and designers on the tour, to which end, knowledgeable guides are to travel with the party in each country. Planning has been based on a party of 30 tour members from those sections of industry dealing with interior furnishing and product design; the cost per person is £185, to cover air travel, full board and accommodation and all gratuities and incidental travel charges. Further information may be obtained from Howard Upjohn at the Design Centre, Haymarket, London, SW1.

WINNERS WERE ANNOUNCED recently of ESMA's fourth competition, which was for illuminated sign displays on a modern, architect-designed shop in the main shopping centre of a provincial town. First prize of £150 was awarded to G. Nash of West Wickham; the judges were particularly attracted by the originality of the design and because it made full use of the large panel above the fascia. Second prize (£75) went to T. R. Crabtree of Prescot; third prize (£40) to H. Kirotar, of London, SE4. More recently, the Association has published a booklet 'Pageant or Penumbra?' advocating a more adventurous approach to design of illuminated signs. The aim is to demonstrate that British sign makers possess both the ingenuity and the craftsmanship to create signs which bear comparison with the best which can be seen abroad and even to surpass them, whilst pointing out that any new approach can only succeed if both sides—planners and sign-makers—are prepared to co-operate by sharing any element of chance inherent in a more enlightened attitude to design. The booklet may be obtained from the Electrical Sign Manufacturers' Association, 13 Bedford Row, WC1.

NEW PREMISES have been announced by four firms in the industry: Lumenated Ceilings Ltd have opened a new area sales office and showroom at 10 Jesmond Street, Newcastle-upon-Tyne 2 (tel: 814301), which will also be a base for their representative, Mr J. Hendry. Continued expansion in the Midlands made it necessary for Courtney, Pope (Electrical) Ltd to move their Birmingham Branch office to Nechells House, Dartmouth Street, Birmingham 7 (tel: Aston Cross 4541); they can now offer trade counter facilities and ample car parking space. Candell Ltd announce that their new factory for manufacturing tungsten lighting fittings is now operating at Riverside Works, Broadmead Road, Woodford Green, Essex (tel: Buckhurst 9501). The factory was opened by Mr E. B. Cadman, managing director; manager of the firm is Mr K. Dipple and chief designer Mr R. W. Whayling. Finally, Philips Electrical Industries Ltd, who recently announced their intention to enter the major-appliance market, are to take over extensive office space in Berkshire House, a new building only 50 yards from their London headquarters, Century House.

Situations

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SENIOR TECHNICAL DRAUGHTSMAN. Able to prepare working details for lighting fittings. Some experience in this field essential. Apply Troughton & Young (Lighting) Ltd, 143 Knightsbridge, SW1.

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Postscript

I WOULD LIKE TO RETURN to the question of night driving and vision, for my comments in January have brought to my attention an article by Dr J. K. Wilkie in the *British Medical Journal*. Dr Wilkie, who has a private ophthalmic practice in Sheffield, found that of 4,422 patients seen in the course of routine examination, 1,011 were holders of current driving licences and of these only 460 were able to read a number-plate at 25 yards without glasses. Another 476 could manage with their glasses, but the remaining 75 could not read the plate. Most of these 75 were over 40 years of age. Only five had failed their driving test because of defective vision, and of these five, two actually had normal vision! 'From this' says Dr Wilkie 'it is apparent that *sometimes* (my italics) the examination of vision carried out on the occasion of a driving test is inadequate'. This seems an understatement. The really interesting thing, which supports my remarks in January, is that 52 of the 75 defectives were unaware that there was anything wrong with their distance vision. Dr Wilkie believes this to be due to the fact that most of them had only mild degrees of refractive error for which they had been able to compensate when younger, and that the deterioration of distance vision was so gradual as to pass unnoticed. If this diminution of daytime vision can pass unnoticed, how much more likely are the more subtle, but potentially more dangerous, deteriorations of night vision to happen without the victim becoming aware of it until he has an accident which he is at a loss to explain.

THE INSTITUTE OF DIRECTORS has brought out an excellent brochure on office design, which by now many of my readers will have been able to study. The section on lighting is particularly good, and right up to date. New ideas on permanent supplementary artificial lighting are described in the context of office layout. The point is made, perhaps for the first time, that the need to partition offices for special purposes renders the basic principles of p.s.a.l.i., as described by the Building Research Station, to some extend invalid. No doubt the BRS engineers and architects will take this point up and let us have their views without delay. If statutory regulations on office lighting are indeed to be laid down, let us hope that they will be the result of careful study by experts. Good regulations can transform bad lighting into good, as has happened in our schools. Poor regulations can perpetuate poor lighting, as in our factories.

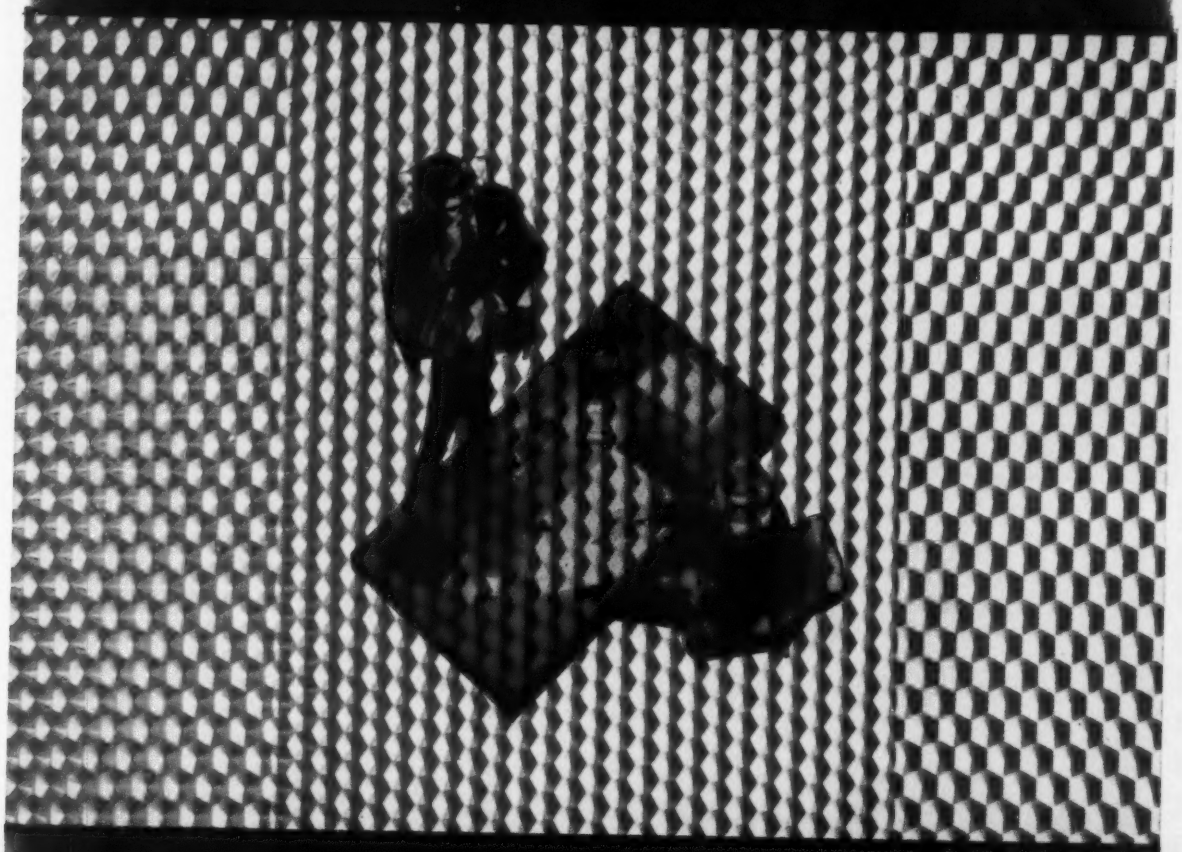
IT IS A SOURCE OF DISAPPOINTMENT that fluorescent lighting has made so little progress in the lighting of homes. I cannot believe that it is a matter of cost, having passed an interesting ten minutes in a big store watching a middle-aged couple spend over nine pounds on a frilly 'shade' of strange design. The colour of the light may be the reason, but a recent experience made me wonder if it is noise. A friend had fluorescent lighting installed in his kitchen some months ago. His wife was 'thrilled to bits' and invited all her friends to see it. As a direct result a family farther down the road put 'de luxe' lighting into their living room, and for a while all went well. Then came noise, ballast noise, which in the case of my friend varied at random from the drone of bagpipes over distant hills to the full chorus of a Trinidad Steel Band. In each case the lighting was installed by a competent electrician charging union rates plus overheads. Both ladies of course feel badly let down and have certainly not kept quiet about the matter. One has had the electrician up to try to put matters right. A wedge inserted somewhere silenced the steel band, but left the bagpipes unaffected. The other lady was told over the telephone that nothing could be done as it was the 'fault of the mains'. I suggest that the lesson of this is that the industry should make a real drive to sell *and instal* first class lighting in homes as a packaged deal on a credit sale basis. Mrs 1970 may have money to burn, but nobody has taken the trouble to show her how to burn it in the cause of good, trouble free, properly designed and installed, lighting. The important thing to remember is that she wants the minimum of fuss now and no bother later on.

BEFORE THE NEW HOSPITALS BUILDING PROGRAMME gets going in earnest, there is work for lighting engineers to do. 'Foot and candle disease' is a greater menace in a hospital ward than almost anywhere else, yet there are still hospital engineers (with full IEE honours in many cases) who believe that the more the meter reads, the better the patients should like it. Now that the IES has produced a workable method for evaluating the glare discomfort, the next step is to produce clear instructions on how to keep within the IES Limiting Glare Index in hospital wards. Perhaps the excellent, but busy, Technical Committee might feel that this could be one of their jobs. If they do, I hope they will bring in one or two of the people who wrote the Nuffield Report on Hospital Design because they had some of the right ideas.

I WAS VERY PLEASED TO READ that the RIBA have awarded a bronze medal for the research building of the Bowater Paper Corporation at Northfleet, Kent. This building has many features of architectural interest and in fact the whole site is a model of a modern industrial layout. The matter of greatest interest to lighting engineers is the design of the drawing office which incorporates an ingenious system of built-in permanent supplementary artificial lighting designed by Mr John Bickerdike. Fluorescent lighting is built into the lantern roof in such a way that it can supplement inadequate daylight without the occupants being aware that they are working partly under artificial lighting. At night the fluorescent lighting at full power operates on its own to give a high level of illumination with the same spread and uniformity as the daylight. Mr Bickerdike's work is always characterised by skill and independent thought and I am surprised that we do not hear more of it. He was responsible, when working at the Building Research Station, for the lighting of the new sections of the Birmingham Art Gallery, which were an early example of the application of apparent brightness technique to lighting design.

'Lumeritas'

IF FLUORESCENT TUBES COULD ONLY SEE . . .



they might find themselves peering down through this while their progeny, the little lumens, become white with heat. For confinement to precise lines of conduct is enough to make any lumen glow.
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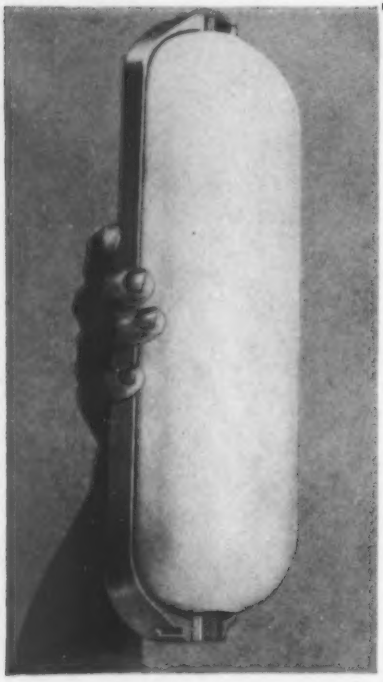

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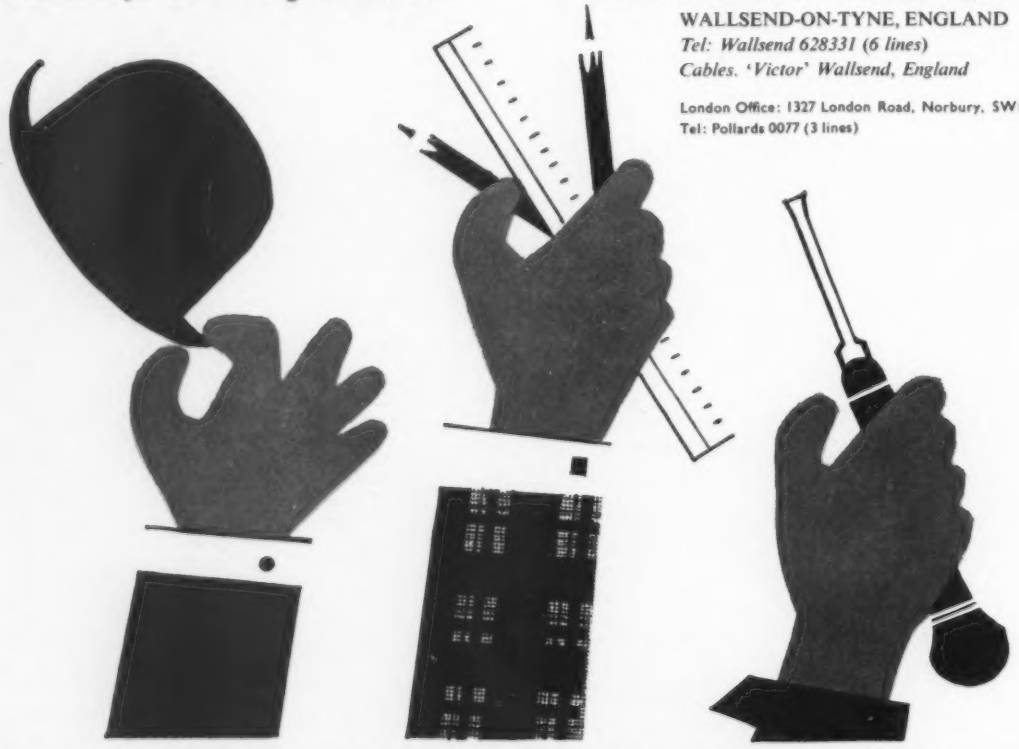

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220 ft. long canopies over the cuttings leading down to the tunnel entrances reduce the amount of daylight reaching the road surface and enable motorists' eyes to adjust themselves to the light in the tunnel. After dark a lower level of illumination is required in the tunnel than in the daytime and is effected by switching off every other lighting unit.

This is the first underpass lighting scheme to be sponsored by the Ministry of Transport, whose consulting engineers, Messrs. Rendel, Palmer and Tritton, worked closely with the G.E.C. Lighting Division and the Electrical Contractors, Messrs. Malcolm and Allan (London) Ltd., throughout the project.

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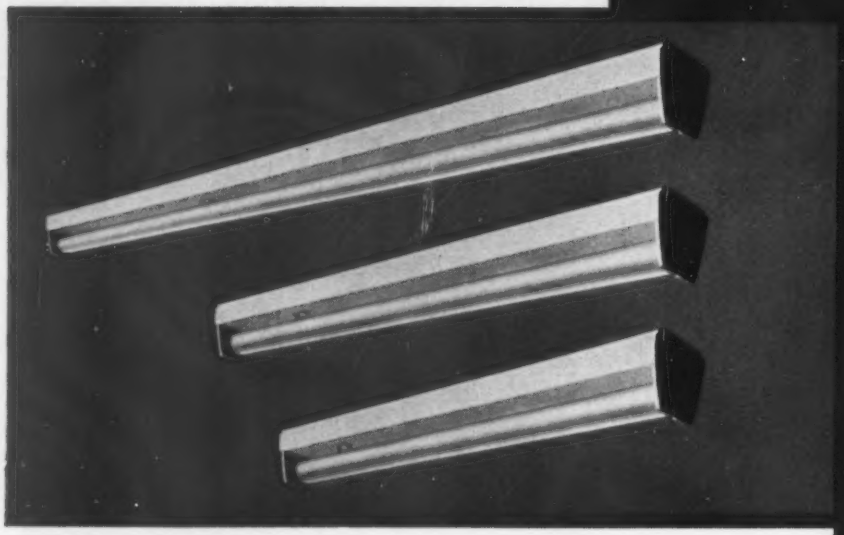

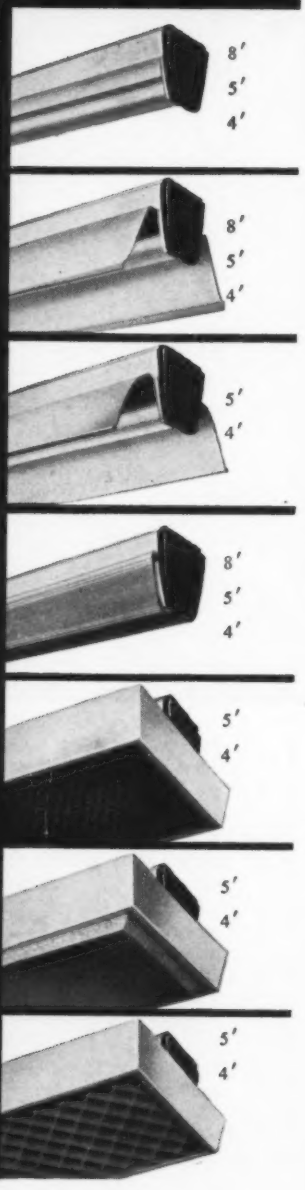

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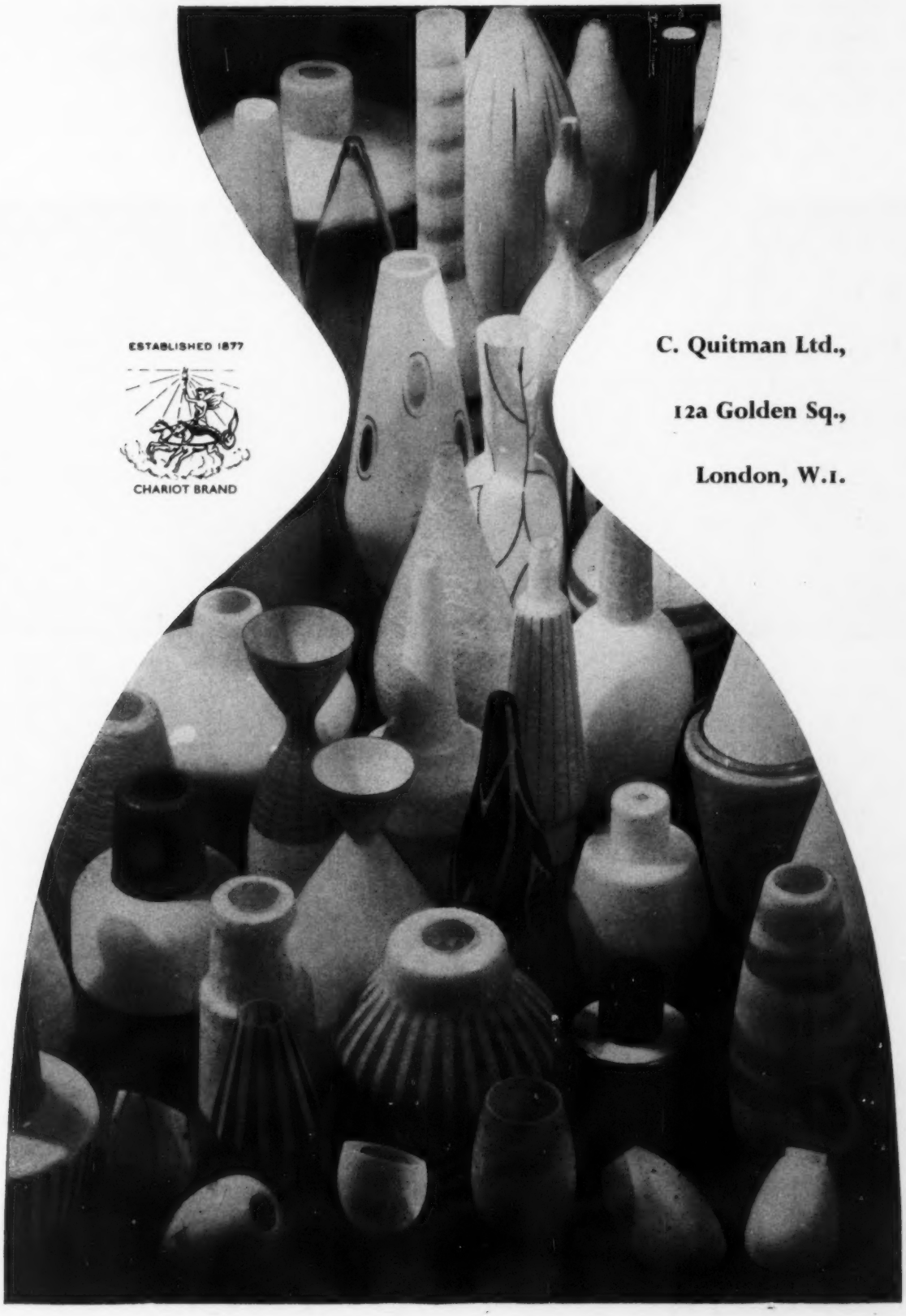

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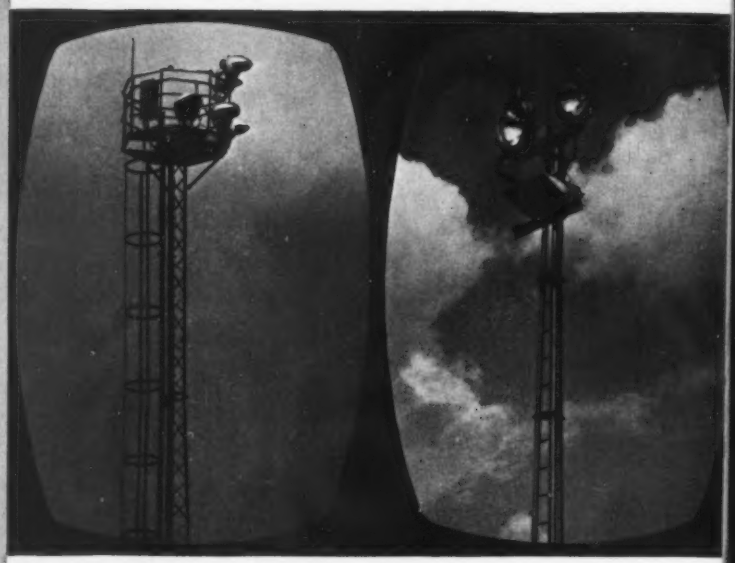

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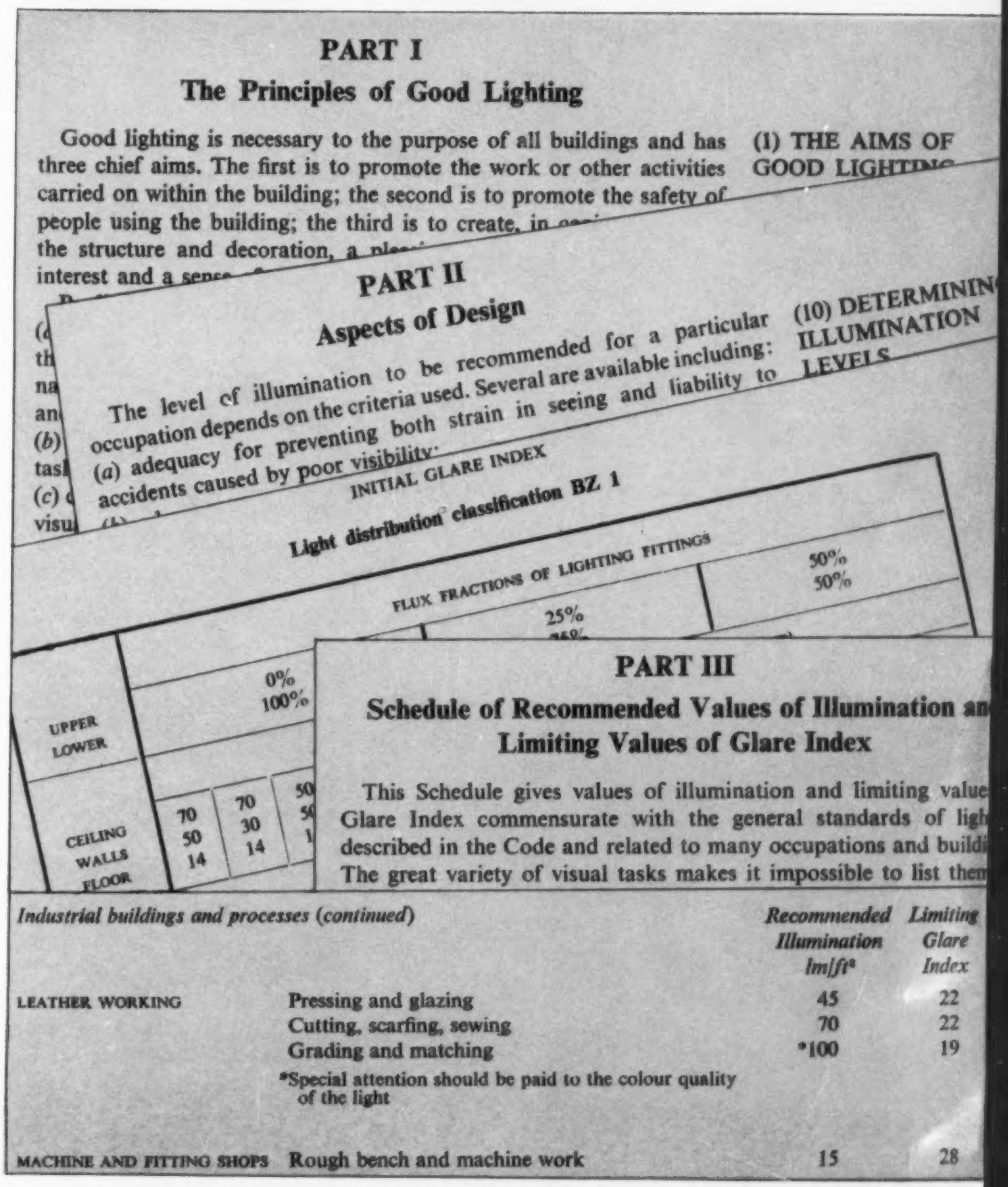

PART I

The Principles of Good Lighting

Good lighting is necessary to the purpose of all buildings and has three chief aims. The first is to promote the work or other activities carried on within the building; the second is to promote the safety of people using the building; the third is to create, in ea... the structure and decoration, a pleas... interest and a sense ...

(1) THE AIMS OF GOOD LIGHTING

PART II

Aspects of Design

The level of illumination to be recommended for a particular occupation depends on the criteria used. Several are available including: (*a*) adequacy for preventing both strain in seeing and liability to accidents caused by poor visibility.

(10) DETERMINING ILLUMINATION LEVELS

INITIAL GLARE INDEX

Light distribution classification BZ 1

	FLUX FRACTIONS OF LIGHTING FITTINGS		
UPPER / LOWER	0% / 100%	25% /	50% / 50%
CEILING	70	70	50
WALLS	50	30	5
FLOOR	14	14	1

PART III

Schedule of Recommended Values of Illumination and Limiting Values of Glare Index

This Schedule gives values of illumination and limiting values Glare Index commensurate with the general standards of ligh described in the Code and related to many occupations and buildi The great variety of visual tasks makes it impossible to list them

Industrial buildings and processes (continued)		*Recommended Illumination lm/ft²*	*Limiting Glare Index*
LEATHER WORKING	Pressing and glazing	45	22
	Cutting, scarfing, sewing	70	22
	Grading and matching	*100	19
	*Special attention should be paid to the colour quality of the light		
MACHINE AND FITTING SHOPS	Rough bench and machine work	15	28

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'Flovic' is the registered trade mark for the vinyl copolymer foil manufactured by I.C.I.

This shows a 'Sylvalume' lighting system made by Atlas Lighting Ltd., installed in a Service Centre of the Merseyside and North Wales Electricity Board. This system, which gives a diffused light, incorporates 3′ x 3′ dishes vacuum-formed in 'Flovic' foil. Some of the dishes have a patterned finish and others a plain finish. An octagonal type diffuser is also available in this material.

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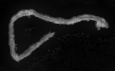
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